luafox

Manual

luafox Version 1.50
20th October 2012

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1 Getting started

1.1 Overview

luafox is an innovative software solution for efficient data analysis and presentation under RISC OS. The graphical user interface makes it easy to learn and use the program and allows performing complex analysis even without scripting knowledge.

luafox is based on the well-established programming language Lua and offers many import and export formats, such as the OpenDokument format for tables. Lua is used internally as scripting language of the program..

Comprehensive configuration allows you to adapt the software to your specific needs and your work-flow. Self defined or default styles can be applied to graphs to change their appearance with only a few mouse clicks.

1.2 History

1.2.1 New features in luafox 1.50

- Multiple step Undo & Redo
- Search & Replace
- New function: Count multiples
- Option to keep cell input field open
- Improoved update of choices

1.2.2 New features in luafox 1.40

- Support of vitual memory
- File history
- Reformat and Header dialog boxes offer to save settings as a script
- New function: Set operations
- Improoved user input handling

1.2.3 New features in luafox 1.30

- Import new MS Excel xlsx Format
- Batch import of csv files
- New function: Skewness and Kurtosis

1.2.4 New features in luafox 1.21

- Choose a graph style before you plot the graph
- A new function allows you to subtract fix values or the minimum or maximum value from a given data set

1.2.5 New features in luafox 1.20

- a completely new graph type: Bar charts
- support for printing
- extended draw export
- Extended automatic selections
- fast switching between graph styles
- add horizontal and vertical lines to your graph
- support for the second x- and y-axis
- add new curves to a graph or edit and delete them
- invert selections
- mask data
- many bug fixes

The updated manual shows all new or extended features in this color so that you do not need to search long for new features. This manual contains many screenshots that belong to the description so that you can better follow the explanations and do not need to sit in front of your computer while reading the manual (although it may be a good idea to play around with luafox in parallel to get used to it more quickly). Please note that not all screenshots have been adopted to the new version of luafox, so don't get confused if there is an icon missiong on a toolbar which is present in the program or on another screenshot of the same window. However, new screenshots have been made at all places refering to a new feature.

1.3 Installing luafox

1.3.1 Minimum specification

luafox will run on RISC OS computers only. The minimum specifications are:

- RISC OS 4
- StrongARM processor (also in emulation)
- 8 MB RAM
- Screen resolution: 1024 x 768
- Latest freely available toolbox release (RISCOS Ltd. website)

Please note that the StrongARM processor is required not only because of its speed. The program will not run on an ARM7 processor, real or emulated. If you are not sure whether luafox will run on your machine please try the demo version first, which is available from the luafox website. The program is 32 bit compatible and runs on the Iyonix computer.

1.3.2 Components

luafox requires some programs and modules to be installed before you can start using it. All components are enclosed in the luafox archive; you do not need to download other components than the toolbox modules, or, if you want to see anti-aliased graphs, SpecialFX.

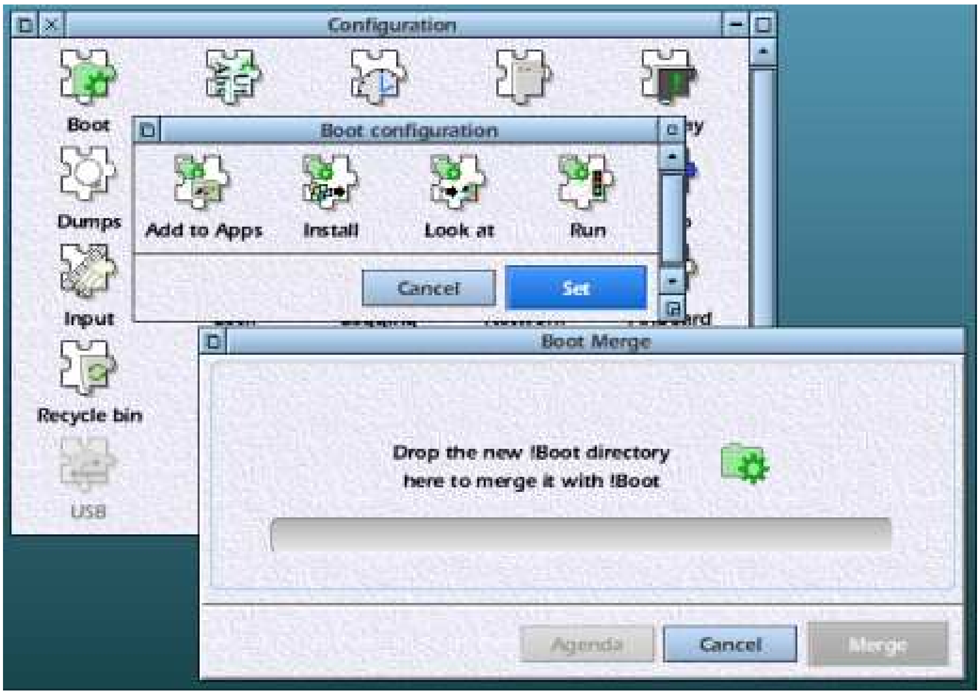
Before running luafox please install the following components:

!lua

!lua is a programming language which is needed to run luafox. Please make a backup of your !Boot directory if you have installed a version of !lua before.
To install !lua, drag the !Boot directory on the system configuration for merging the boot sequence.
This will install RiscLua 4.14 in !Boot.Resources. Please note that the core is identical to RiscLua 4.14 from Gavin Wraith's website but the libraries have been extended. luafox will not run with the version from the website. **Please do not try to use RiscLua 5**.
You can also manually install !lua at another place but please make sure it has been seen by the filer before trying to run luafox.

!System

Please use the system configuration to merge the !System directory. It looks very similar to the configuration option for the !Boot directory. It will install two new modules: TreeView and Tabs from Rik Griffin website.



Drop the new !Boot directory here to merge it with !Boot

Drag the !Boot directory to the configuration window

!ConfiX

If you do not already have a recent version of ConfiX installed please add ConfiX to your boot sequence. See the installation instructions inside ConfiX to find out how to install it on your computer.

!luafox

To install luafox just drag it to a directory of your choice. Please make sure that the path is not more than 200 characters long. The Data directory contains example data files and can, together with this manual, be copied to any place on your harddrive.

!SpecialFX

In order to display anti-aliased graphs and enable background blending of fonts you can install SpecialFX.

!DrawPrint

To allow printing of tables and graphs luafox makes use of the !DrawPrint applications which allows you to split large tables and print them on many sheets. !DrawPrint needs to be seen by the filer before starting luafox. However, you do not necessarily run !DrawPrint, it will be started and by luafox automatically and closed afterwards.

Please note that !lua, !ConfiX, the TreeView and Tabs modules as well as the zip and unzip applications and !DrawPrint are used by luafox with the kind permission of the authors. Other than the !luafox application these components may be distributed freely according to the license file of these components. When in doubt please contact the authors of these components directly. Please also note that you did not pay for the distribution of these packages.

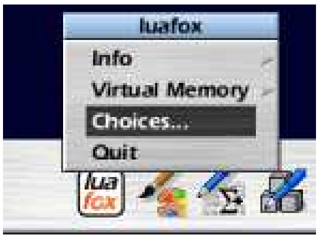
1.4 Loading the program

After double clicking on the program icon in a filer window the Luafox icon appears on the iconbar. Click with the left mouse button on the iconbar icon to open the Project Manager on the left side of the screen. It is separated into three main parts called Pinboard, Project and Favorites.

luafox will also starting up automatically if you double click a luafox or Open Document Spreadsheet file.

1.5 Configuration

luafox allows you to adjust the behavior of the program to your needs. To configure luafox use the iconbar menu:



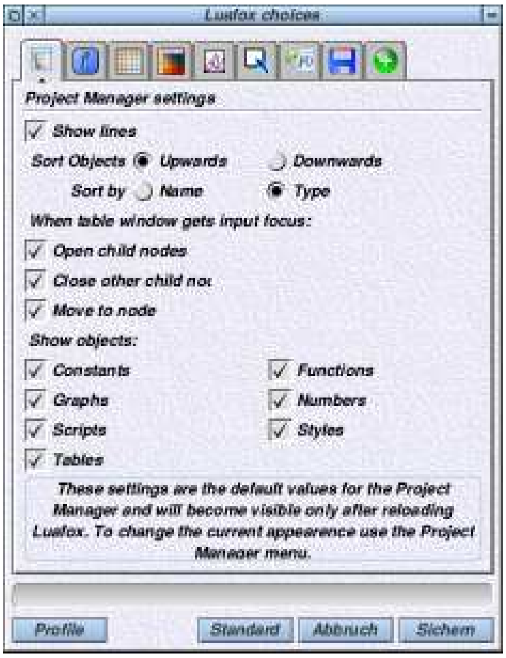
Open Choices by using the iconbar menu

This will bring up the configuration window which is provided by the ConfiX tool, which is not part of luafox itself.[1] The configuration window should look like the screen shot shown below.

The individual options are described in the relevant sections of this manual. All options show a small help text when the mouse pointer is over them. Please note that ConfiX allows a convenient way of saving profiles. These profiles allow you to change all settings at once which might be useful if different task require different settings. This is also useful if luafox is used by several users who prefer different settings[2]. To save a profile use the menu and give it a name. To load a profile just click on the "Profile" button of the configuration window.

[1] The appearance of the configuration window depends on the settings you made for the ConfiX tool. You can find the ConfiX tool in !Boot.Resources. Double clicking it will open the ConfiX configuration window. It is recommended to use Graphical Tabs which is the default setting.

[2] If you are using RISC OS Select with several users the luafox choices are stored in individual choices directories anyway.



Project Manager settings

☑ Show lines

Sort Objects ● Upwards ○ Downwards

Sort by ○ Name ● Type

When table window gets input focus:

☑ Open child nodes

☑ Close other child noc

☑ Move to node

Show objects:

☑ Constants	☑ Functions
☑ Graphs	☑ Numbers
☑ Scripts	☑ Styles
☑ Tables	

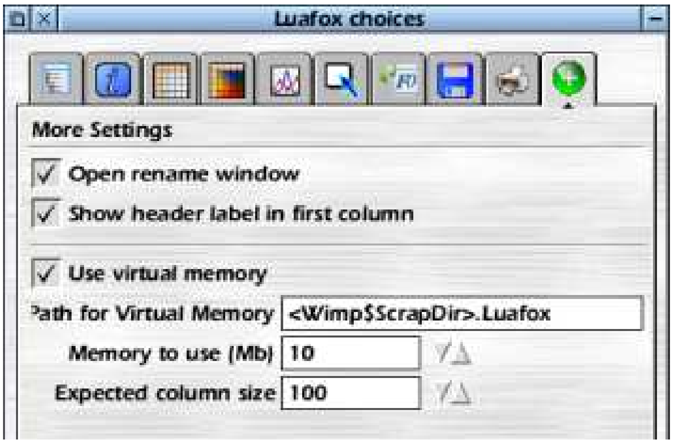
These settings are the default values for the Project Manager and will become visible only after reloading Luafox. To change the current appearence use the Project Manager menu.

Configuration window

1.6 Virtual memory (introduced in luafox 1.40)

Since all versions of RISC OS except version 5 only allow applications to use 27MB of memory and there is no system wide virtual memory there is the need to intruduce virtual memory in luafox itself.

You can configure the use of virtual memory in the choices in section "more settings":



More Settings

☑ Open rename window

☑ Show header label in first column

☑ Use virtual memory

Path for Virtual Memory: <Wimp$ScrapDir>.Luafox

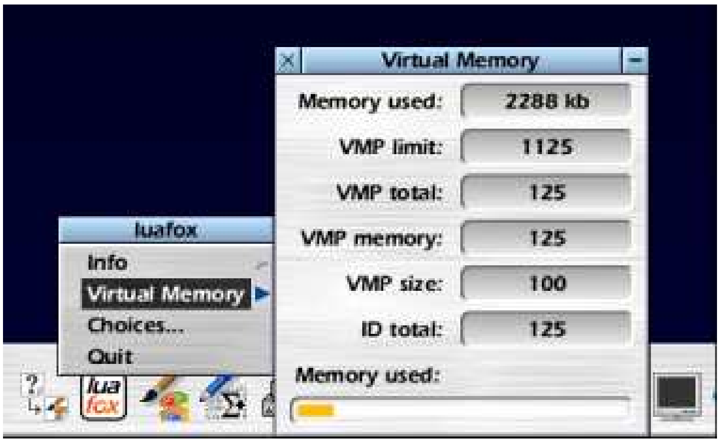
Memory to use (Mb): 10

Expected column size: 100

Set the options regarding the use of virtual memory

You can set whether or not luafox should use virtual memory. You should consider using it if you are handling larger amounts of memory and you are not using a computer with RISC OS 5 and a lot of RAM. You can set the path for the data files that are stored by luafox if the memory limit is reached.

You can specify the maximum amount of memory luafox is allowed to use. If this limit is reached luafox will start to store data on disc. Please note that this will slow down luafox since access to a harddrive is much slower than accessing the RAM. So do not set the value to low. On the other hand, since RISC OS allows only 27MB of application space you should set it to value below 27 MB because the memory limit is an estimation and not an exact value. So under certain circumstances luafox may use a little bit more memory than specified in the configuration. So we recommend a value between 10MB - 20MB.



Virtual Memory

Memory used: 2288 kb

VMP limit: 1125

VMP total: 125

VMP memory: 125

VMP size: 100

ID total: 125

Memory used:

Overview of the virtual memory usage

Please note that you must restart luafox as soon as you changes this values. Otherwise the memory management of luafox may be damaged which may lead to loss of data.

The rest of this section is only interesting for advanced luafox users who would like to know more about the virtual memory system luafox is using:

luafox will always store whole columns on disc. But one column can be split into several data files if the column exceeds a certain size. Every file is called "Virtually Memory Package" or short VMP. The size can be set in the field "Expected column size", see the configuration window. If the data you are using always has the same number of lines then you can optimise the virtual memory system by entering this typical column size here.

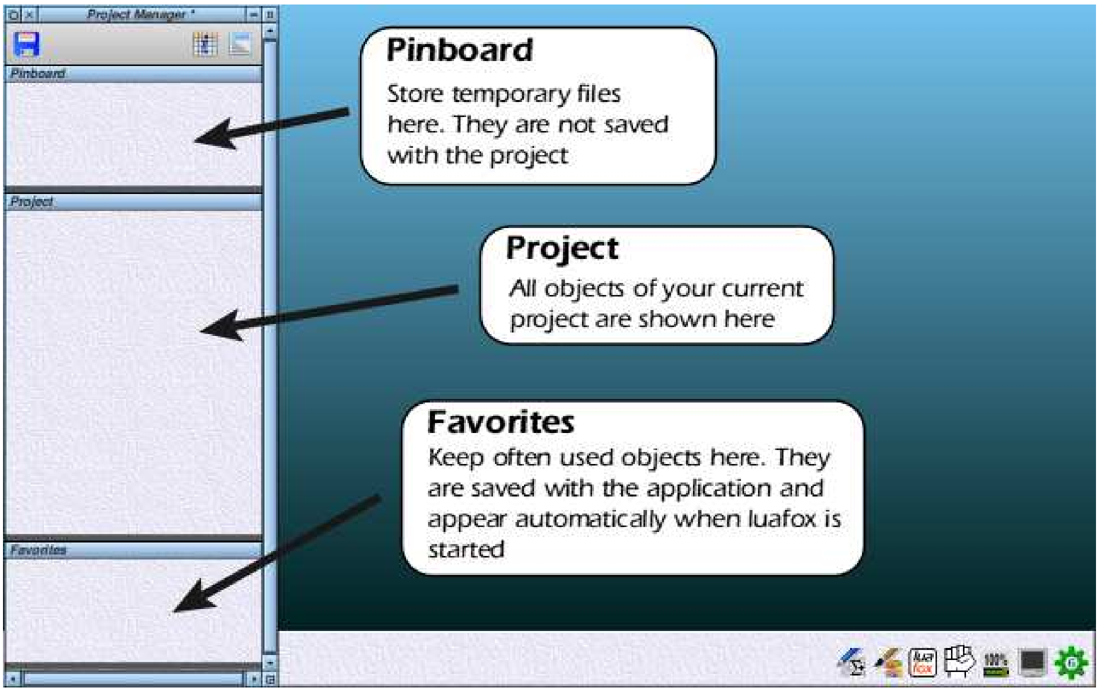
From the iconbar window you can always have a look of the current memory state. The first entry tells you how much memory the lua code it using. Please note that this is only the size of the code itself and does not include the toolbox windows and sprites used in the application. So this value will always be lower than the value shown in the task manager. Also lua itself will optimise its memory usage automatically. So if you are following the value (it only get's updated if you reopen the window) you will see that it rises for some time and then drops to a low value again. This is normal and should be nothing to worry about.

The VMP limit shows how many VMPs may be in memory at a time. This value is influenced by the maximum memory to be used as specified in the main configuration. If the column size is lower than the "expected column size" set in the configuration than the number of VMPs is identical to the number of columns used by luafox. In the above example a max. memory usage of 10MB and an expected column size of 100 allow 1125 colums to be in memory at the same time.

The "VMP total" field contains the number of VMPs currently used by luafox. If this value is lower than the limit then all data is held in memory. A higher value means that some data has been temporarily stored on disc. At the bottom of the window this is also shown graphically. If the yellow bar is filled up completely luafox starts to use virtual memory.

"VMP memory" shows how many VMPs are currently in memory. "VMP size" just shows the configured value. "ID total" shows the number of columns that are used by luafox.

1.7 The Project Manager



Pinboard
Store temporary files here. They are not saved with the project

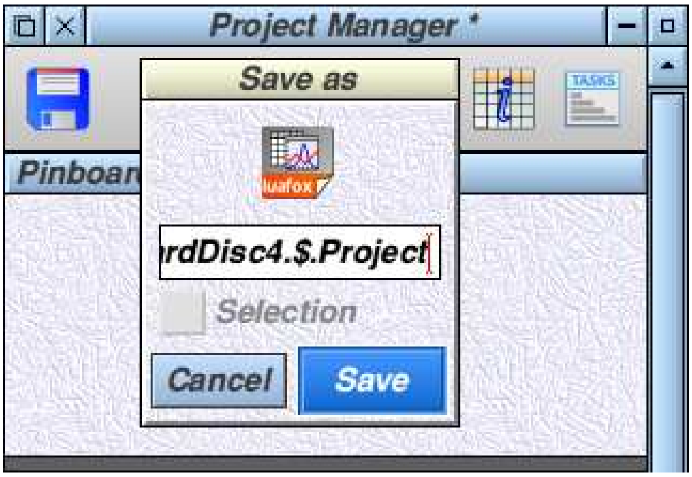
Project
All objects of your current project are shown here

Favorites
Keep often used objects here. They are saved with the application and appear automatically when luafox is started

The Project Manager is separated into three sections: Pinboard, Project and Favorites

The Project Manager holds all the different objects (Tables, Graphs,...) of a project. It allows you to copy objects, rename and delete them. All objects can be moved and copied between the three sections of the Project Manager: Pinboard, Project and Favorites.

The Project window contains all the objects that belong to the current project. The content is saved as luafox file if you press the disc symbol in the toolbar at the top.



ırdDisc4.$.Project

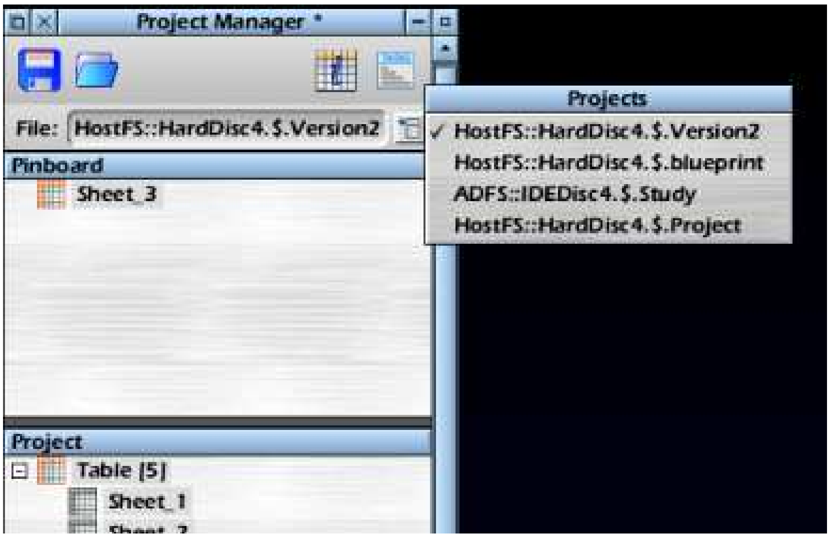
□ Selection

Save the project as luafox file by clicking the disc symbol in the toolbar at the top of the project Manager

The Pinboard is a place where objects can be stored temporarily. They are not saved in the luafox file. The Pinboard can be used for items that are used only once. It helps you to keep the project file clean. Do not forget to move important objects to the Project window before closing the application, otherwise they will be lost.

The Favorites window contains objects which are often used. The contents of the Favorites window is saved with the application and is always available again after starting luafox. It is not saved with the Luafox file. Remember to copy all relevant objects into the Project section before saving, if you intend to distribute the file to other people or use it on another machine.

The window size can be changed by dragging the grey separator bars between the three sections.


Project Manager *
File: HostFS::HardDisc4.$.Version2
Pinboard
Sheet_3
Project
Table [5]
Sheet_1
Projects
✓ HostFS::HardDisc4.$.Version2
HostFS::HardDisc4.$.blueprint
ADFS::IDEDisc4.$.Study
HostFS::HardDisc4.$.Project

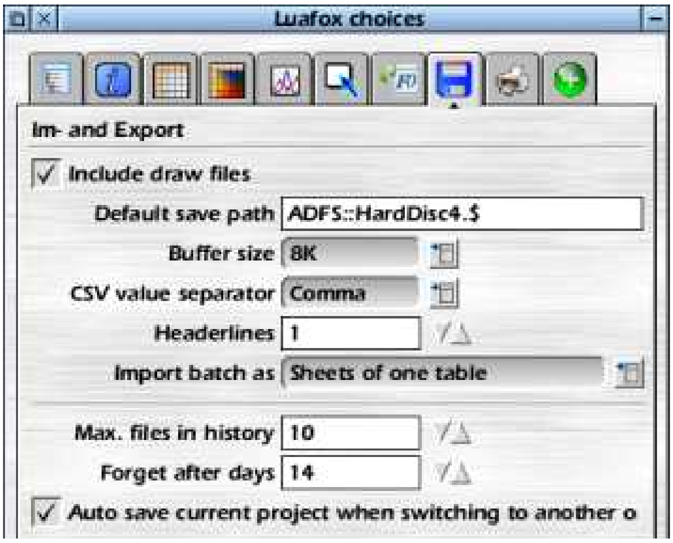
The file history gives an overview about all recently changed projects and allows you to change quickly between projects and exchange data using the pinbaord.

The file history (introduced in luafox 1.40) lists all project files that have been saved before. This makes it easy to continue working on a project without the need to open its directory. Also it allows you to switch between a number of projects very quickly. Since all the data of a project is always stored in the Project section you can place a number of tables, numbers, scripts etc. in the Pinboard, switch to a new project and copy the objects back from the Pinboard to the Project. This is a very easy way to exchanges objects between different projects.

To open the filer window containing the current project click Adjust on the save project icon.

In the main configuration you can set a few related settings. You can define the maximum number of files in the history. You can also specify the number of days after which the used files are forgotten so that you do not pile up a stack of old project files.

The last option specifies whether changes in the current project are saved automatically if you switch to another project file. It has the advantage that you are not always ask whether you would like to save the data when you switch to another project. On the other hand you may save a project in a state you do not want to be saved.



Luafox choices

Im- and Export

☑ Include draw files

Default save path: ADFS::HardDisc4.$

Buffer size: 8K

CSV value separator: Comma

Headerlines: 1

Import batch as: Sheets of one table

Max. files in history: 10

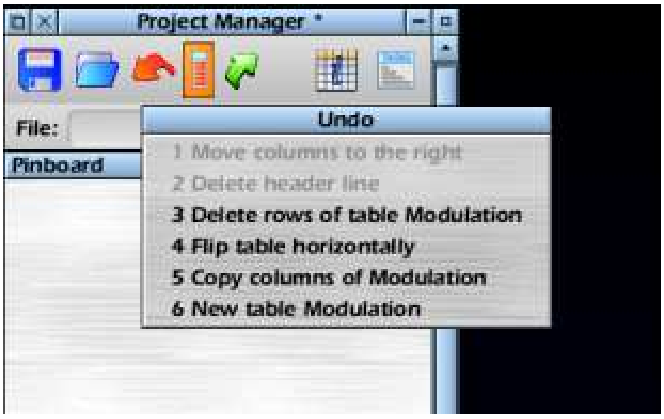
Forget after days: 14

☑ Auto save current project when switching to another o

Configuration for the file history

1.8 Undo & Redo (introduced in luafox 1.50)

luafox supports multiple undo & redo, so that all unwanted or accidental operations can be undone. To undo an operation just press on the left red arrow in the toolbar of the Project Manager. If you want to redo the action click on the right green arrow. It is also possible to undo more than one step at once. Just click on the undo list icon bewteen the arrows to get a list with all previous operations. Please note that clicking on an entry will undo all operations above the entry as well. All undone operations will appear grey in the list and show you which operation will be redone when clicking the green arrow.



Project Manager *

File:

Pinboard

Undo

1 Move columns to the right

2 Delete header line

3 Delete rows of table Modulation

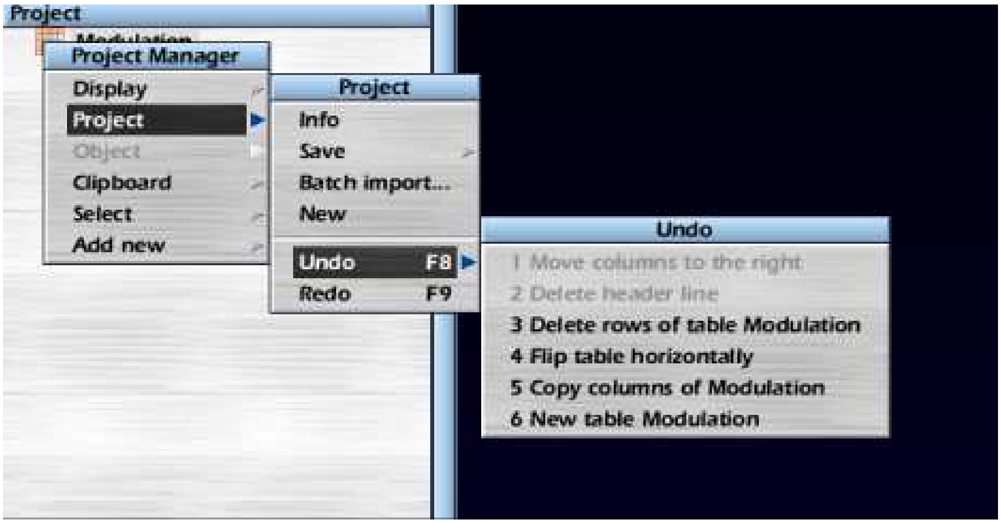
4 Flip table horizontally

5 Copy columns of Modulation

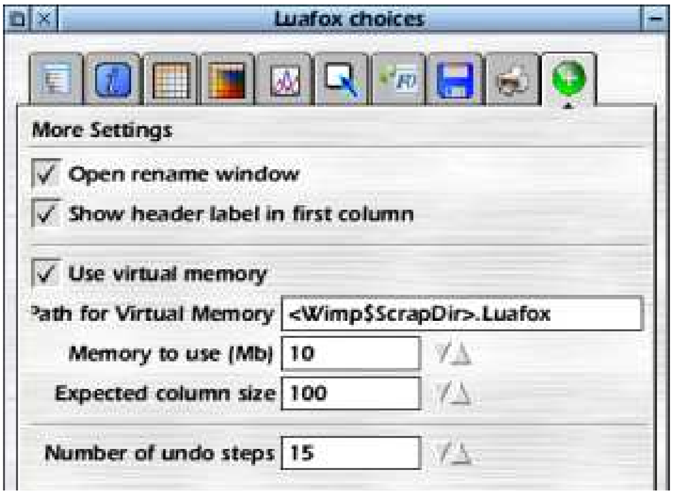
6 New table Modulation

Undo & redo buttons in the Project Manager

It is also possible to reach undo and redo from the project manager menu tree or by pressing F8 (undo) or F9 (redo) when the table window has the input focus. The maximum number of operations that can be undone is defined in the luafox main choices dialog.



Accessing the undo & redo function using the menu tree



More Settings

☑ Open rename window

☑ Show header label in first column

☑ Use virtual memory

Path for Virtual Memory: <Wimp$ScrapDir>.Luafox

Memory to use (Mb): 10

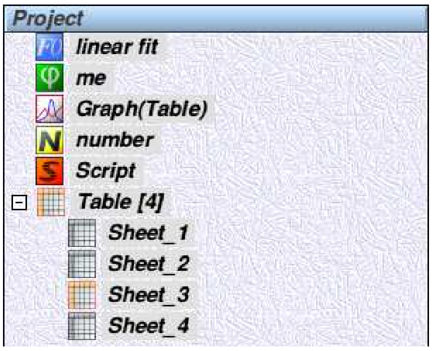
Expected column size: 100

Number of undo steps: 15

Set the number of undo steps in the configuration

1.9 Objects

Objects are stored in the Project Manager. You can add an object by loading a file (e.g. import a CSV file) or by using the menu of the Project Manager.

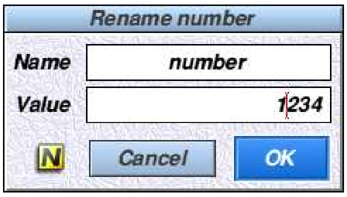


Project window showing different objects types

Some of the objects are described here only very briefly. A complete description can be found in the chapters dedicated to some of the object types.

1.9.1 Number

An Number object simply holds a number that can be user defined or may be the result of a calculation. Double click on a Number object to change the number or its name. Click ok or drag the number icon to the Project Manager to add it there. In some writeable fields you can access the number by using the variable name: n.<name>, e.g. n.result.


Rename number

Name: number

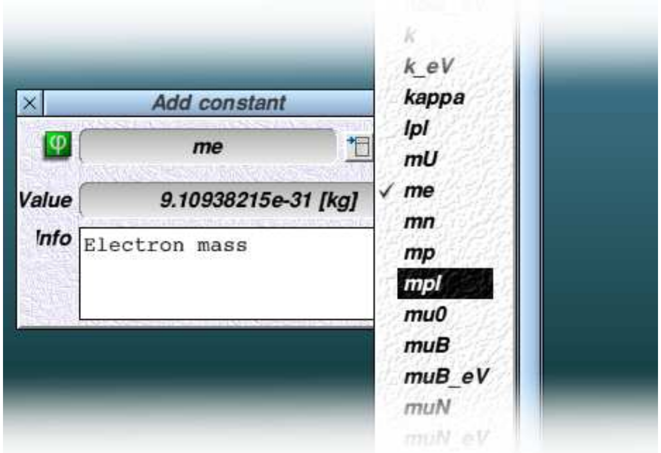
Value: 1234

Change the name or value of a number object

1.9.2 Constants

luafox contains a predefined set of often-used scientific constants. If you open the add constant window you will find a menu which lets you choose between all the known constants. If you choose a constant, the numeric value, its unit and a short description are shown. Click ok or drag the constant icon to the Project Manager to add it there.

In writeable fields you can access constants by using the constant name c.<name>, e.g. n.me for the electron mass.


Add constant

me

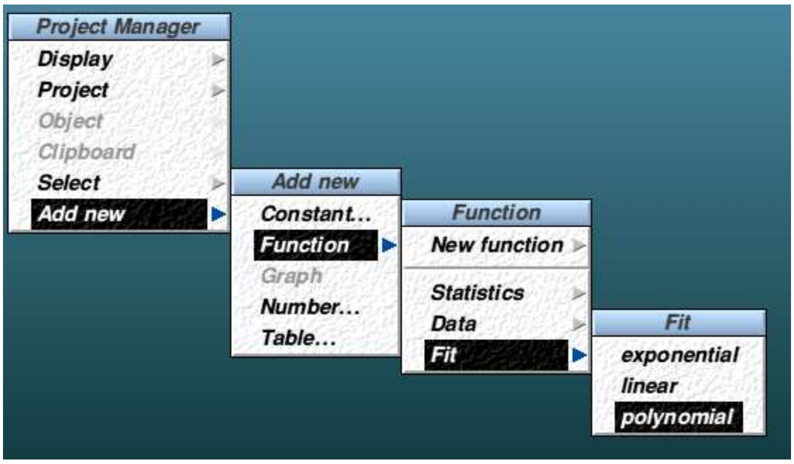
Value: 9.10938215e-31 [kg]

Info: Electron mass

Add a scientific constant by choosing it from a menu

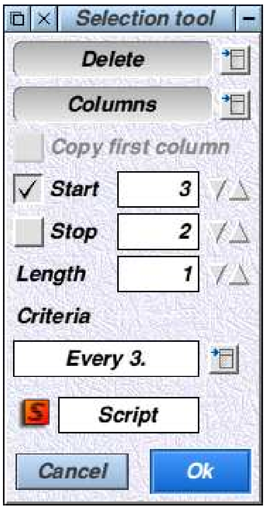
1.9.3 Functions

luafox contains a number of scientific and mathematical functions which you can choose from the list. It is also possible to define your own functions. You can add Functions to the Project Manager using the menu. They can be dragged to Table objects or Table windows to apply the function to the data. You can also define your own functions and edit them later. Built-in functions cannot be accessed or edited by the user. Functions are described in detail in a separate chapter.



Use the menu structure to add a new function

1.9.4 Scripts



☑ Start 3

□ Stop 2

Length 1

If you often want to perform the same operation, save the settings in the form of a script file that can be applied to other objects

Some tools and functions need several settings to be made before they can be applied to a table or selection of data. A script allows you to store these specific settings and keep them as an object in the Project Manager. To add a script, just drag it to one of the Project Manager windows. Dragging it from there onto a specific object in the Project Manager will apply the script to it.

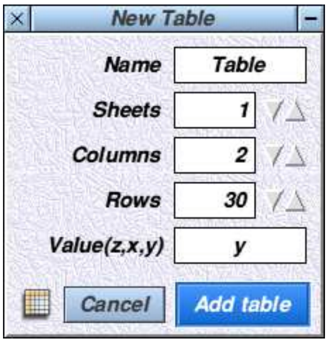
This is a very efficient way to perform often used tasks.

1.9.5 Tables

Table objects are used to store the data. A Table object can contain more than one sheet. If you open the add table window a number of parameters can be set. All of these parameters can be changed later. You need to specify how many sheets the table has, how many columns and rows each sheet has and what values to fill in.

The value field can be left black. You can also enter a number here, or use one of the

following variables. The variable x contains the current column. If you enter `x` in the value field the first column will be filled with the number 1, the second with 2 and so on. Use `y` to insert the row number and z to insert the sheet number. Also strings can be inserted by using quotes. Try e.g. the following: `"Cell("..x..","..y..")"`.



Name: Table
Sheets: 1
Columns: 2
Rows: 30
Value(z,x,y): y

Add a new table by specifying the name and the number of sheets, columns and rows. The value field can contain a number or an expression using x,y,z.

The program is written in the programming language Lua and its internal scripting language is also Lua. Therefore you will find the Lua syntax at different places in the program. Here the two dots .. are used to concatenate a number of strings. Although x and y are numbers they can be concatenated to strings - this is handled automatically by Lua.

In this writeable value field you can also access numbers and constants. It is also possible to access other table cells. To do this, use the syntax:

`Tablename[sheet][column][row]`.

If you create a new Table object a new icon will be added to one of the Project Manager windows. Whether the table window opens automatically depends on the program settings.

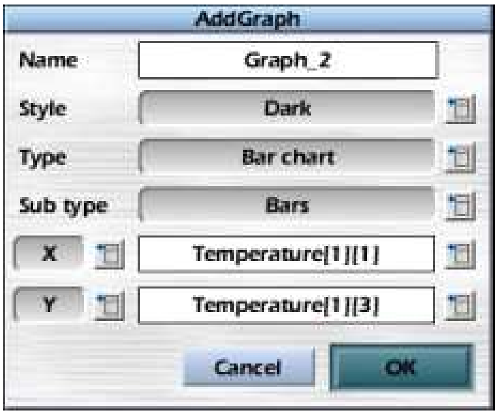
Tables with more than one sheet appear in the Project Manager with a small + sign next to them. If you click on the + sign the sheets of the table will also be shown in the Project Manager. You can rename the sheets by using the Menu. One of the sheets will be the active sheet of a table. This is the sheet which gets shown if you double click on the table object icon to open the table window. A double click on one of the sheet icons will set this sheet as the active sheet and show it. The active sheet also plays an important role for drag & drop actions.

1.9.6 Graphs

Graph objects represent graphs. To create a graph you usually select some data columns in a Table window and create the graph by clicking on the line or bar graph button.

It is also possible to create a new graph from scratch. From the menu just select Add new -> Graph... and a dialog box appears. Here you need to enter a name, a graph style, the type of the graph, e.g. Line graph and its Sub type, for example "scatter". Afterwards the x and y data needs to be added by the menu or manually. A click on the OK button will open the graph.

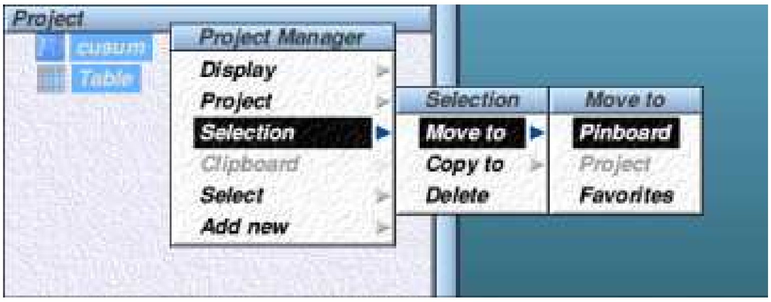
A detailed description of making graphs can be found in the dedicated chapter.



Name: Graph_2
Style: Dark
Type: Bar chart
Sub type: Bars
X: Temperature[1][1]
Y: Temperature[1][3]

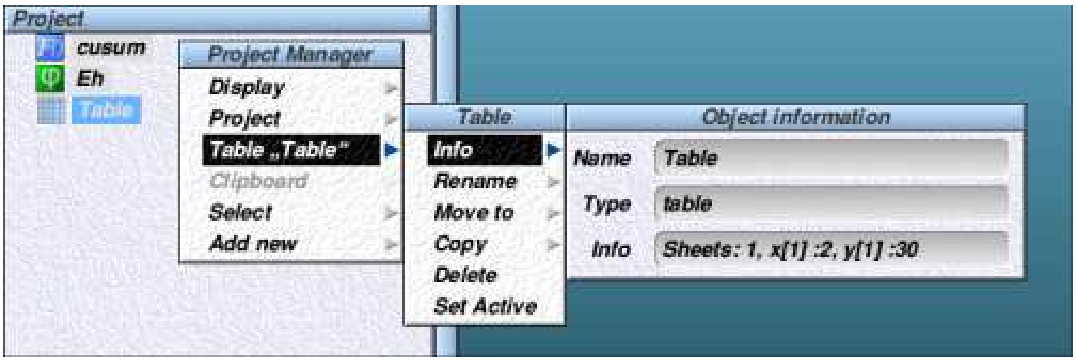
Dialog box to add a new graph

The Project Manager menu also contains an entry to change an object or a selection of different objects:



Change a selection of objects by using the menu

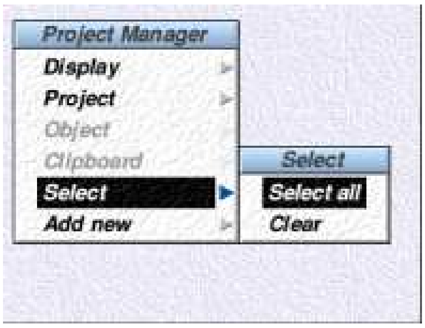
If different object types are selected, objects can only be copied, moved and deleted. It is also possible to move or copy objects to one of the other windows by drag&drop. The left and right mouse buttons define whether the object is moved or copied. The mouse button actions can be defined in the configuration.



Name: Table
Type: table
Info: Sheets: 1, x[1] :2, y[1] :30

Object menu showing information about a table

If a single object is selected it is possible to show more information. As shown above the info field displays information about a table: The number of sheets and the x (columns) and y (rows) dimension of the first sheet. Individual objects can also be renamed. For certain object types more specific options become available, e.g. table sheets can be set active or functions can be edited. Often this additional option can also be reached by double clicking the object.

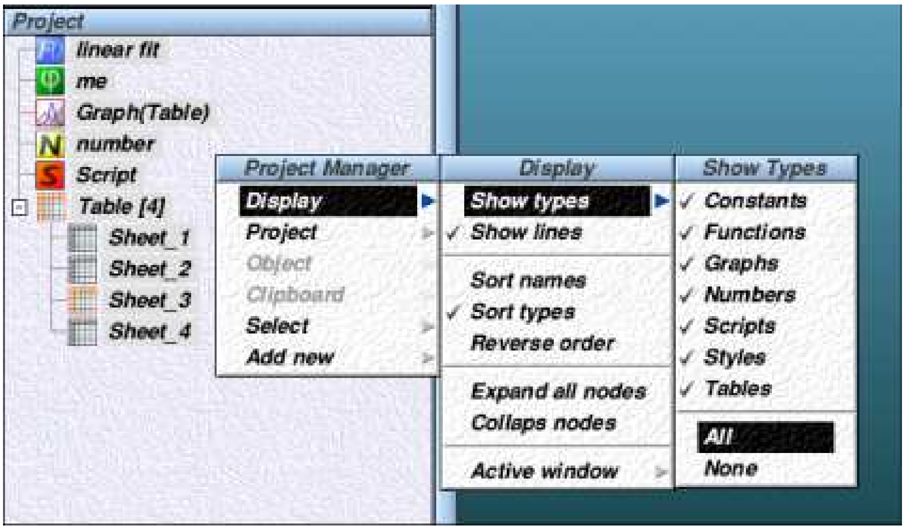


Menu item to select all objects or clear the selection

The Project Manager menu also offers the option quickly to select all objects or clear the current selection.

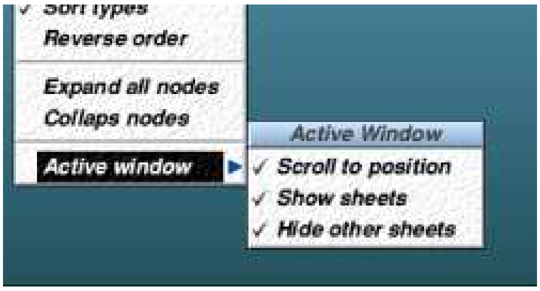
1.10 Display options

luafox uses the treeview toolbox gadget to display all objects. You can set several display options by using the first menu entry:



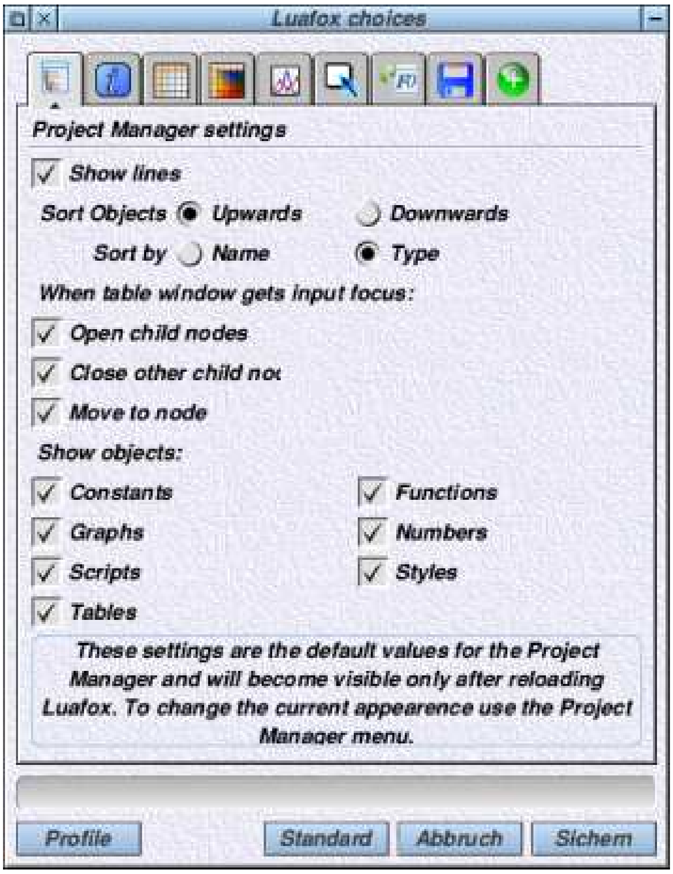
Use the menu to set display options for the Project Manager

You can specify which types should be shown. It is possible to display lines between the objects to show their relationship. Objects can be ordered by name or type and the order can be reversed. If you click on the option to expand or collapse all nodes the display of table sheets is changed. If collapsed only the main table icon with a "+" sign next to it is shown, otherwise all sheets are shown as in the screen shot above.



Set some options that influence the display of table nodes

If you are working with several tables that contain more than one sheet it is useful to set some active window options. The active window is the table window with the input focus. It is possible to scroll the Project Manager window to a position that shows the node that belongs to the active window. This is only necessary if there are so many objects in the Project Manager window that it is not possible to show all. The second option will expand the active window node so that its sheets become visible. If the third option is ticked the sheet nodes of other table windows are hidden when the input focus changes from one to another table window. All these options can also be set in the main configuration:



Project Manager settings

☑ Show lines

Sort Objects ● Upwards ○ Downwards

Sort by ○ Name ● Type

When table window gets input focus:

☑ Open child nodes

☑ Close other child no

☑ Move to node

Show objects:

☑ Constants ☑ Functions

☑ Graphs ☑ Numbers

☑ Scripts ☑ Styles

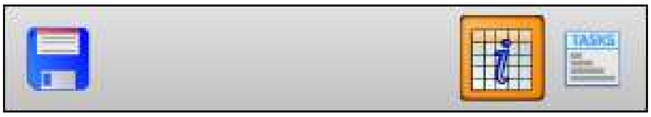
☑ Tables

These settings are the default values for the Project Manager and will become visible only after reloading Luafox. To change the current appearence use the Project Manager menu.

Choices window to set the display options for the Project Manager windows

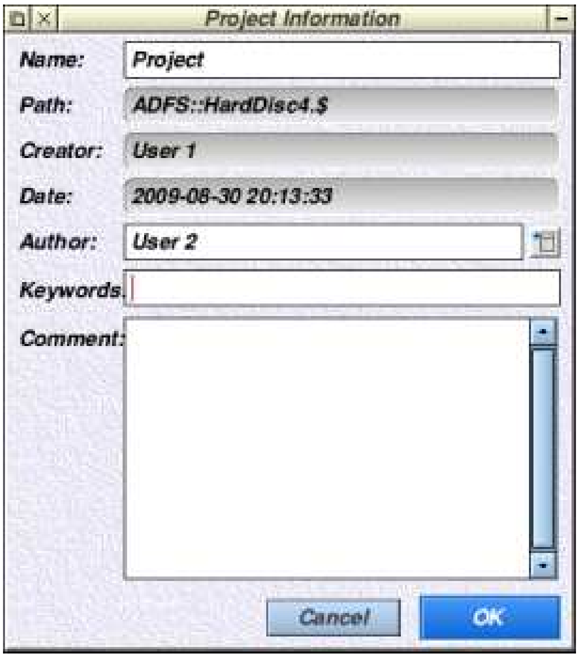
1.11 Project Information

The project information window can be opened by clicking on the toolbar or using the Project Manager menu.



Project information icon indicating that the information window is open

Use the project information window to change important settings of the current project, such as the name of the current project. The path of the luafox file or the default save path is shown in the second field. The third filed contains the name of the creator; this is the initial author. The date field shows the date of the initial creation of the file. In the author field you can specify the name of the current author. You can save the author's name in the configuration. It is possible to save several keywords inside the luafox file to provide further information. It is also possible to leave a comment. This is especially useful if you save a lot of data files or exchange the files with other persons.



Project Information

Name: Project

Path: ADFS::HardDisc4.$

Creator: User 1

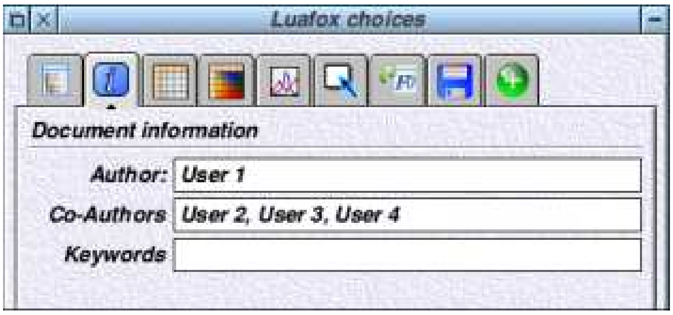
Date: 2009-08-30 20:13:33

Author: User 2

Keywords:

Comment:

Project information window



Luafox choices

Document information

Author: User 1

Co-Authors User 2, User 3, User 4

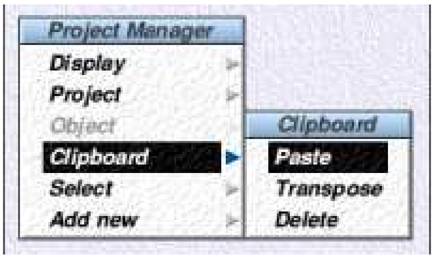
Keywords

luafox configuration: Project information

The name of the main author and of possible co-authors can be set in the configuration. It is also possible to specify there a number of standard keywords there which you would like to include in every luafox document.

1.12 Clipboard

Table columns, rows and blocks of data can be copied to the clipboard as described in the table section. If there are some data in the clipboard it is possible to paste these data into a new table by using the menu.

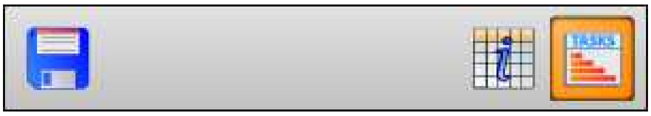


Use the clipboard menu to paste the data as a new table,
transpose the data or delete them

The menu also offers the option to transpose the data so that columns and rows are exchanged. This might be useful if you copy a data column and you would like to paste it into another table as a row. To save memory it is also possible to delete the content of the current clipboard.

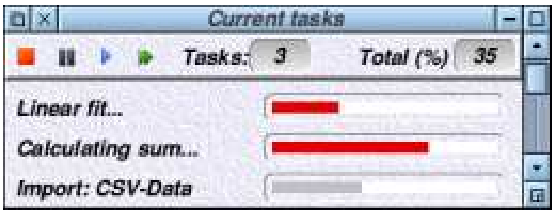
1.13 Multitasking

luafox supports internal multitasking. It can execute several operations at once. So while a complicated calculation is running in the background it is still possible to continue using luafox and to manipulate other data tables.



Project Manager toolbar indicating that the task window is open

You can open a task window that shows the progress of current tasks:



Tasks: 3 Total (%) 35

Linear fit...
Calculating sum...
Import: CSV-Data

Task window with three tasks executing at once

In the top section, which is also visible if there are no current tasks, the total number of tasks being executed is shown. Below, a list of tasks is shown and a small description is given. Note that the total number of tasks can be higher than the number of items in the list. This is because some functions may open a dialog box and wait for the user to press the OK button. Here a progress bar makes no sense and so it is not shown. The second display field in the top part shows the progress of a task, if it reaches 100% then all tasks are done.

Current tasks are not only shown but they can also be influenced.

If one or several tasks are selected you have four options:

- Stop: Stop the selected tasks
- Pause: Pause the selected tasks. Usually the progress bar is shown in red. If a tasks is paused then it turns to gray
- Play: Click to continue with any selected task. The progress bar will become red again
- Fast Forward: If you select one task and click the fast forward button only this task will be executed until it is finished. Then all other tasks continue automatically. Note that it does not speed up the calculation of the task if there is only one.

Please note that not all tasks use multitasking or show a status bar.

1.14 Loading luafox files

To load a luafox file (filetype &ab7) simply double click it or drag it to the iconbar or the Project Manager. A luafox file is basically a compressed zip file containing a number of directories and an index and meta file. This allows you to recover data from a broken file or, for example, access the tables as ODS files or the graphs as draw files (if luafox has been configured to save draw files) on machines where luafox is not installed. The disadvantage is that it takes longer to open and save luafox documents because all files need to be zipped or unzipped.

Inside a luafox file there are directories for every object type. The table directory just contains a number of ODS files as used e.g. by Open Office. The number and constants directory contains a text file with a list of all used numbers and constants. The function directory contains a text file for every function, and for user defined functions also the script. The graph directory contains a new directory for every graph. Inside you can find the graph style, the plotted curves and further settings like the zoom level. There may also be a draw file of the graph which makes loading faster. Please note that a graph can only be loaded if the data file is also present. So if you create a graph, and delete the table which contains the data, then the graph still exists in the Project Manager. It is also saved inside the luafox file but it is not loaded anymore because the data points are not saved within the graph, but only linked to a data table, and so that the graph cannot be updated anymore.

1.15 Importing data

1.15.1 Open document spreadsheets (ODS)

luafox uses the open document format to save tables. The open document format is an open and well documented format that is used by a variety of applications. The best known is the freely available Open Office.

If a luafox table is saved in the ODS format and loaded back into luafox, all settings, headers and column expressions will be recovered. This information gets lost when the table is opened with another package and saved again in the ODS format.

Tables saved by luafox can be read by Open Office without further steps. Some additional information is saved in the table and shown by Open Office: The column type (X,Y,...), Header values and expressions to calculate column values. These are shown as part of the data table since Open Office does not have the header concept.

It is possible to import certain open document spreadsheets. The import is limited to the capabilities of luafox. In particular some data types, styles and formulas cannot be imported. luafox tries its best to import the data from spreadsheets.

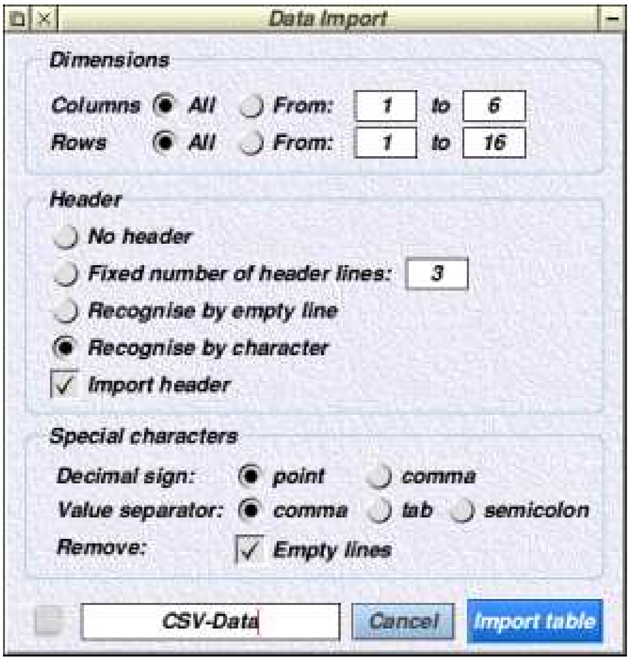
1.15.2 New Microsoft Excel Format (xlsx) (introduced in luafox 1.30)

Microsoft introduced a new file format for its office programs some time ago, which is completely different from the old format. Like the ODS file format any xlsx file is a zip directory containing a collection of files which describe data tables as well as formulars, graphs etc. luafox will import the data of xlsx files, no formulars, graphs etc are supported. To load an xlsx file just drag it to the Project Manager. The RISC OS file type is &a7f. You may also be able to import files with the DOS extension xlsm, which is basically an xlsx file including macros - of course the macros themselfs are not supported.

1.15.3 CSV and TSV data files

Data can be imported from almost every data handling application in CSV format. It can then be imported into luafox by dragging a CSV (comma separated value) file to the Project Manager. An Import window will pop up which allows you to specify how the CSV will be imported. At the top you can set whether all columns and rows should be imported or only part of the file.

In the middle section you can define the header of the CSV file. Often CSV files contain some information about the data before the actual data. If you choose no header, then the whole file will be interpreted as data and every value will be put into the table. You can also set a specific number of header lines, if you know how many lines should be handled as header. Another option allows the program to recognize the beginning of the data section by the first empty line. Everything above the line will be treated as header, everything below as data. The default setting is the last option which tries to recognize the data by comparing the character at the beginning of the line. Often the header contains words and the data consists of numbers. So the program starts to import the data when it finds the first line that starts with a number (quotes are ignored). You can choose whether the header lines are imported and shown in the Table window, or whether the header is ignored.



Dimensions

Columns ● All ○ From: 1 to 6

Rows ● All ○ From: 1 to 16

Header

○ No header

○ Fixed number of header lines: 3

○ Recognise by empty line

● Recognise by character

☑ Import header

Special characters

Decimal sign: ● point ○ comma

Value separator: ● comma ○ tab ○ semicolon

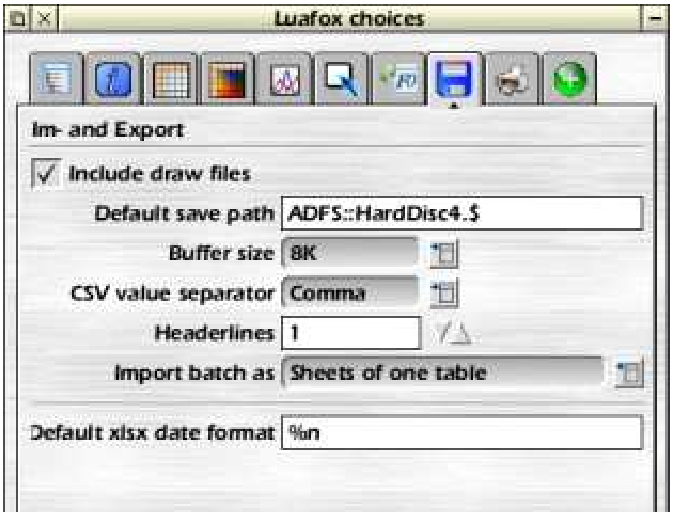
Remove: ☑ Empty lines

CSV-Data

Import of CSV files

The CSV file is analyzed before the options window appears. If the automatic recognition is wrong you can specify which character is used to separate the values from each other (comma, semicolon or tabs) and which is used for line feeds. Also you can set an option to ignore empty lines that may appear in the file.

Some general settings can also be made in the main choices. The first option lets you choose whether graphs are saved as draw files inside the luafox file. This will increase the size of the luafox file but loading luafox files will be much faster since the graphs do not have to be created again. Instead the draw file is loaded and used until the refresh button is pressed.



Im- and Export

☑ Include draw files

Default save path: ADFS::HardDisc4.$

Buffer size: 8K

CSV value separator: Comma

Headerlines: 1

Import batch as: Sheets of one table

Default xlsx date format: %n

Import and export settings

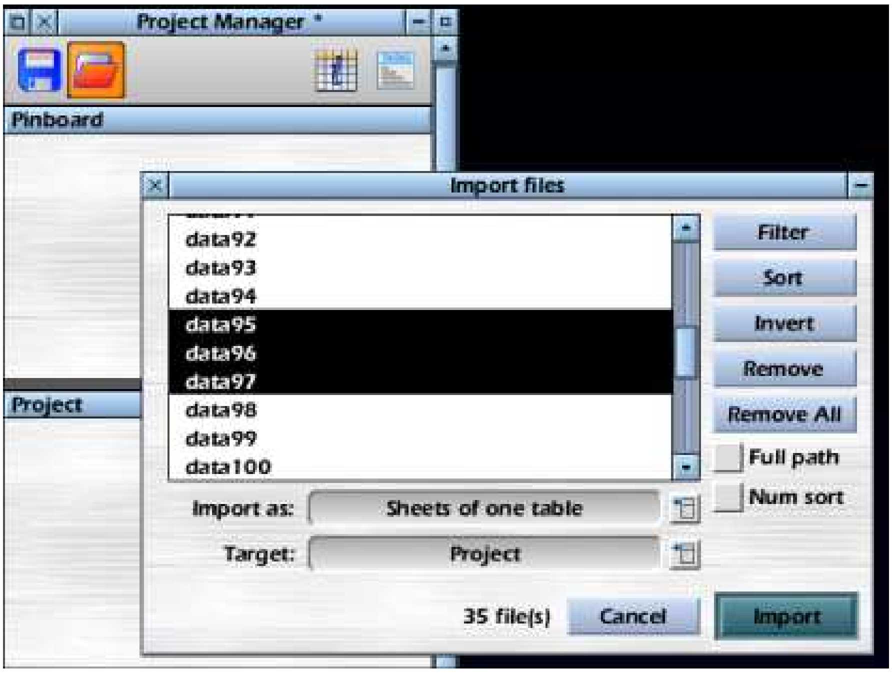
The default save path contains the place where you want to save the project file by default. The buffer size specifies how much data is read at once when importing CSV files. A large buffer will make loading faster but multitasking or responsiveness of luafox and the desktop will slow down. You can also set here the default CSV separator, that is the sign that separates the values inside of a data file. You can use this if the files you import always have the same structure. You can also set the default number of header lines.

1.15.4 Batch import of CSV and TSV files (introduced in luafox 1.30)

Often the data you would like to import is spread over several files. So there may be 50 files all containing one x and one y column. The batch import tool helps you to load all the data files at once and merge it for example into a single table. If you have only one data file there is no need to use this tool, just drag it to the Project Manager as described in the paragraph above.

To open the batch import window click on the open directory icon just next to the save icon. Drag all data files you would like to import on the scroll list, the total number of files is shown towards the bottom of the window. The files will be imported in the same order as they have been dragged onto the scroll list. In a moment we will see how the order can be changed.

Below the scroll list there are two more options which determine how to import the data files. You have the option to import them as individual tables. In our example shown above you would end up with 35 tables. The second option will import them as sheets of one table. So in the end there will be one table containing 35 sheets. The third option will create only one sheet and import the data as columns. If every file contains two data columns you will create a table with 70 columns. The default choice can be set in the main configuration as shown in the configuration window (previous paragraph).



data92
data93
data94
data95
data96
data97
data98
data99
data100

Import as: Sheets of one table

Target: Project

35 file(s)

Window for batch import of data files

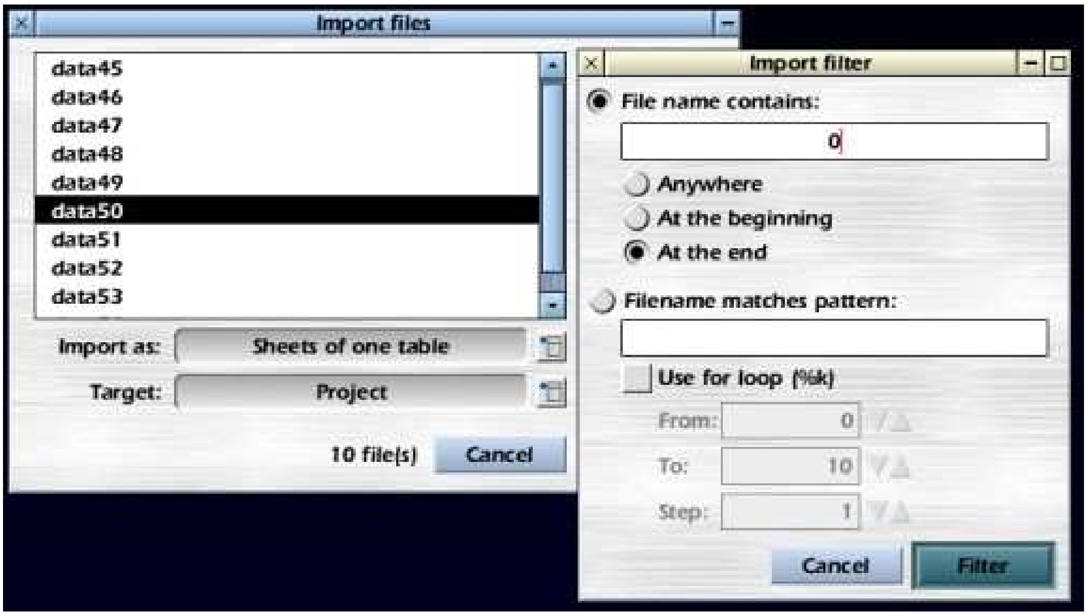
The second option lets you choose where you would like to import the table, e.g. in the Project window. Finally, to import the files just click on the Import button. Details are given below.

Please note that all files in the scroll list, not only the selected ones, will be imported. The batch import dialog box allows you to manipulate the list in a few ways. First of all, with the "Full path" option you can show the full path of the files. If all files are stored in the same place only the file name may be important but if you wish to display the full path just select this option.

There may be situations where you only need to import a special selection from a big pool of data files. The filter function lets you select a subset of the entries in the scroll list in a very flexible way.

There are two filter options, one simple and a more advanced one. In the simple option you can just enter a phrase which should be part of the items to be selected. You can also choose whether the string can be anywhere in the filename (or path, see below) or just at the beginning or end of it.

Please note that the filter will work on the filename or path as currently shown in the scroll list. So it will make a difference whether the "Full path" option is ticked or not. Imagine that the you have a series of diretories which contain the date, e.g. 201108xx where xx is the day. If all directories now contains a data file with the same name like 'info', you need to show the full path first and then apply the filter to it since the filenames themselfs are do not differ.



Import files

data45
data46
data47
data48
data49
data50
data51
data52
data53

Import as: Sheets of one table

Target: Project

10 file(s)

Import filter

● File name contains: 0

○ Anywhere

○ At the beginning

● At the end

○ Filename matches pattern:

□ Use for loop (%k)

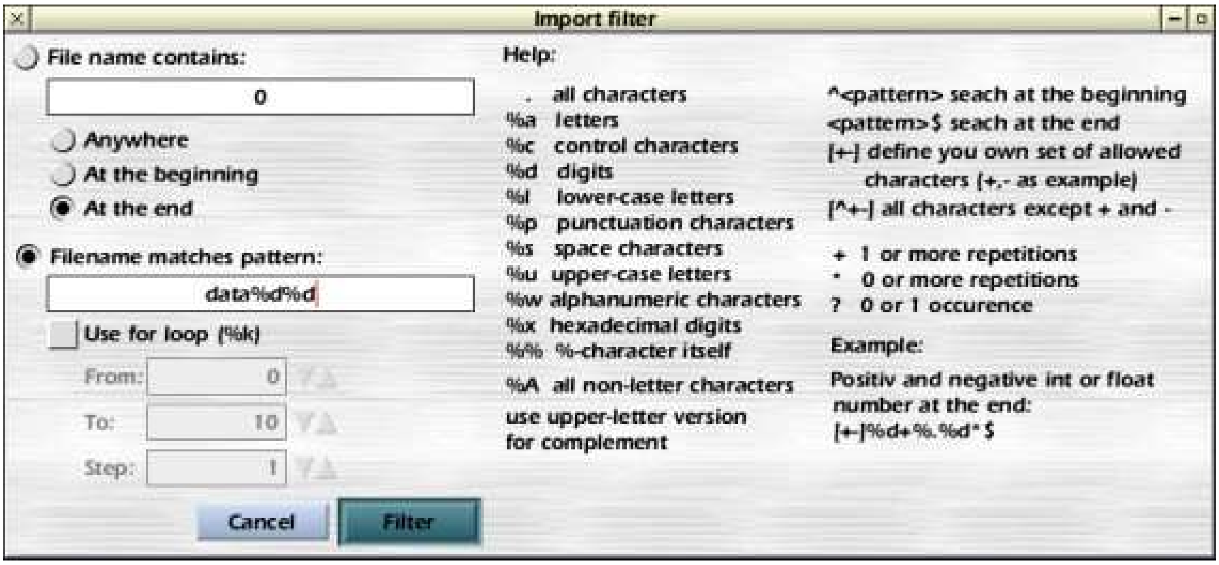
From: 0

To: 10

Step: 1

Use the filter to select all items in the scroll list that match certain criteria

Use the second option to patch a given pattern. It uses the wildcards lua itself provides. Please refer to a lua manual for the full options available. If you enlarge the filter window the most commonly used wildcards are explained shortly. As an example data%d%d will filter all files containing the sequence 'data' followed by two digits. The list shows which wildcard will represent which group of letters or symbols, for example %s for space characters. If you use a capital letter the complement will be matched. So %D will fild any character except digits. For example to make sure only numers with two digits are found you could change the pattern into 'data%d%d%D?'. As you can see there is a question mark at the end of the pattern. That means that a character behind the two digits is optional. So the file 'data53' will be selected, but als 'data53B' but not 'data531'. Use '+' if the character may appear once or more in the file name. So 'data%d+' will find all files containing 'data' followed by any number or digits, but there must be at least one digit. Use '*' if the digit can also be missing.



○ File name contains: 0

○ Anywhere
○ At the beginning
● At the end

● Filename matches pattern: data%d%d

□ Use for loop (%k)
From: 0
To: 10
Step: 1

Help:

.	all characters
%a	letters
%c	control characters
%d	digits
%l	lower-case letters
%p	punctuation characters
%s	space characters
%u	upper-case letters
%w	alphanumeric characters
%x	hexadecimal digits
%%	%-character itself
%A	all non-letter characters

use upper-letter version
for complement

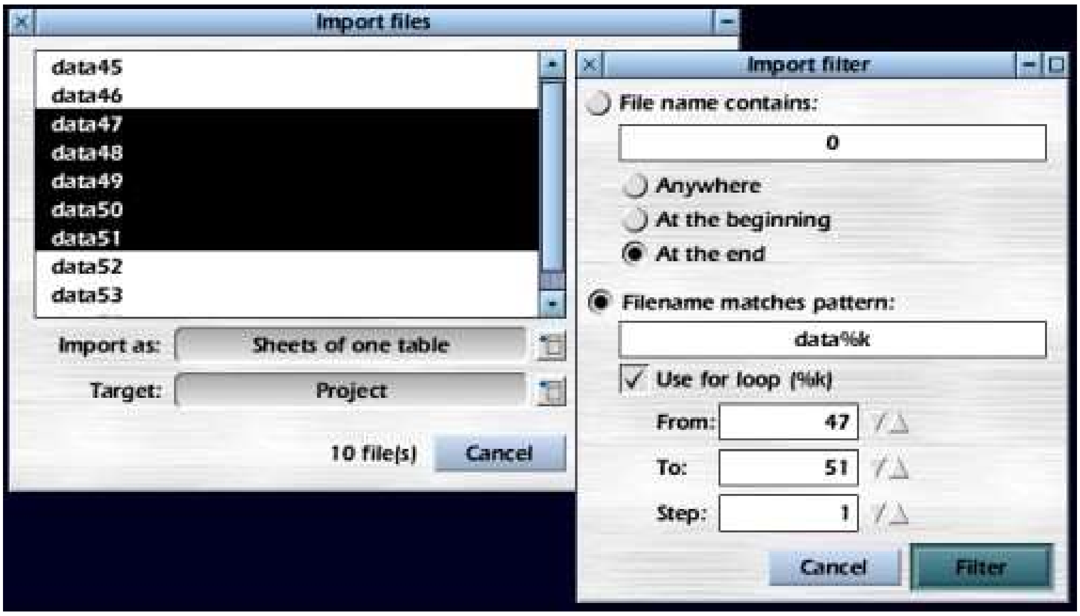
^<pattern> seach at the beginning
<pattern>$ seach at the end
[+-] define you own set of allowed
characters (+,- as example)
[^+-] all characters except + and -

+ 1 or more repetitions
* 0 or more repetitions
? 0 or 1 occurence

Example:
Positiv and negative int or float
number at the end:
[+-]%d+%.%d* $

Advanced filter options using pattern matching

If the wildcards are not precise enough you can also define your own subset by setting square brakets around a given set or characters. So 'data[56]+' will only match filenames that contain data followed by any sequence of the digits 5 and 6: 'data55', 'data6', 'data5565' etc.



data45
data46
data47
data48
data49
data50
data51
data52
data53

Import as: Sheets of one table
Target: Project
10 file(s)

○ File name contains: 0

○ Anywhere
○ At the beginning
● At the end

● Filename matches pattern: data%k

☑ Use for loop (%k)
From: 47
To: 51
Step: 1

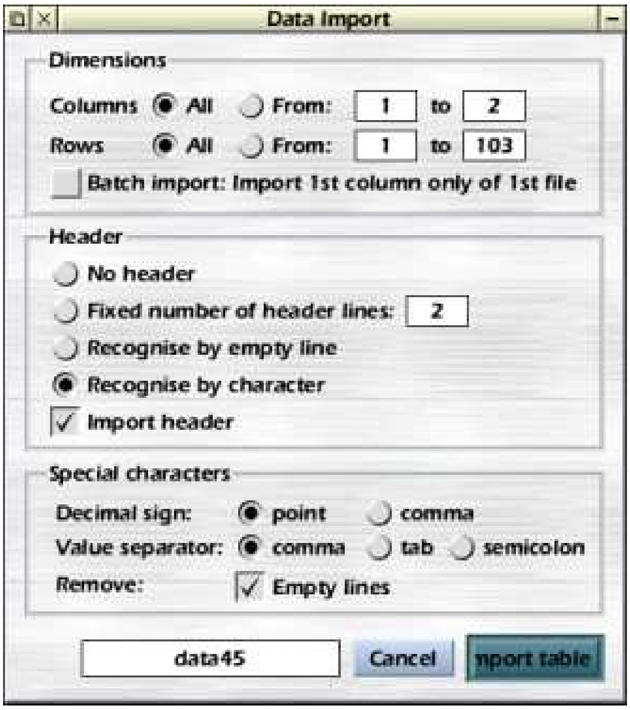
Use a for loop to select files containing a certain number range

With the option to use a for loop you have an additional way to select a number of files. You can specify a start number, an end number and a stepping. Shown here is a way to select all files from 'data47' to 'data51'. Just place the wildcard '%k' at the place of the number given by the for loop.

The second button on the right hand side lets you sort the files shown in the scroll list. Click with Select to sort the files in alphabetic order, click with Adjust to sort them in descending order. If the file names of you data files are "data1", "data2", "data3" ... "data10" then you encounter the problem that the files will be sorted in the wrong numeric order: "data1", "data10", "data2", ... To avoid this tick the "Num sort" option.

You can select several files of the scroll list and remove them from the list by clicking on the remove button. The invert button will invert the selection as expected. Together with the filter option this is a powerfull tool. Click with Adjust on the invert button to select or deselect all entries. The last button will remove all entries from the list.

If the scroll list contains all the files you would like to import click on the import button and the first file will by analysed and the CSV-import window will pop up. This window is well known from the previous section about importing CSV files. You can also use all options as described above. This dialog box will only appear once, for the first file. All the option will be used for all the files in the list. That means that the batch import function only works for files which have the same structure. All files should have the same number of columns, rows and headerlines, otherwise the result may not be as expected.



Data Import

Dimensions

Columns ● All ○ From: 1 to 2

Rows ● All ○ From: 1 to 103

□ Batch import: Import 1st column only of 1st file

Header

○ No header

○ Fixed number of header lines: 2

○ Recognise by empty line

● Recognise by character

☑ Import header

Special characters

Decimal sign: ● point ○ comma

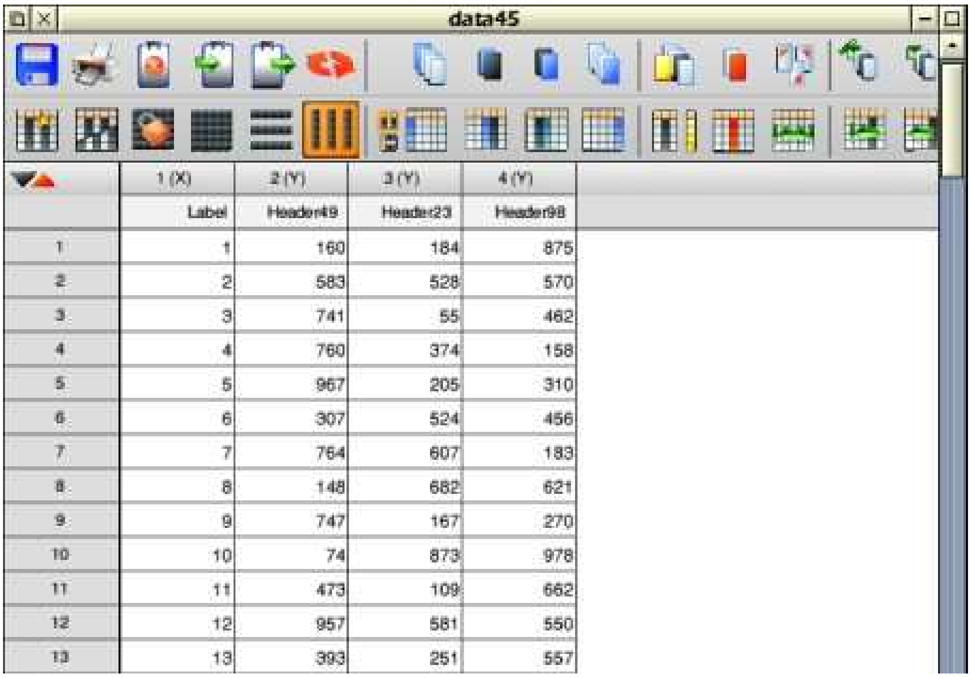
Value separator: ● comma ○ tab ○ semicolon

Remove: ☑ Empty lines

data45

CSV-Import window for batch import

There is a new option regarding the batch import: Import the first column only of the first file. Often data files contain one X and a number of Y columns. If they all belong to the same series of measurements the X column will often be the same in all files. So there is no need to import it more than once. The additional X columns are probably unwanted. So when you tick this option the first column will be imported only when the first file is processed. All following files will start with the second column.



	1 (X)	2 (Y)	3 (Y)	4 (Y)
	Label	Header49	Header23	Header98
1	1	160	184	875
2	2	583	528	570
3	3	741	55	462
4	4	760	374	158
5	5	967	205	310
6	6	307	524	456
7	7	764	607	183
8	8	148	682	621
9	9	747	167	270
10	10	74	873	978
11	11	473	109	662
12	12	957	581	550
13	13	393	251	557

Result of batch importing three files as columns of one sheet

The screenshot contains the data window showing the result of batch importing three CSV files. Each file contains two columns, one X and one Y column. It was imported as columns of one sheet and the option to import the first column only of the first file was ticked. You end up with a table containing only one X column which is ideal to plot the data or further analyse the data.

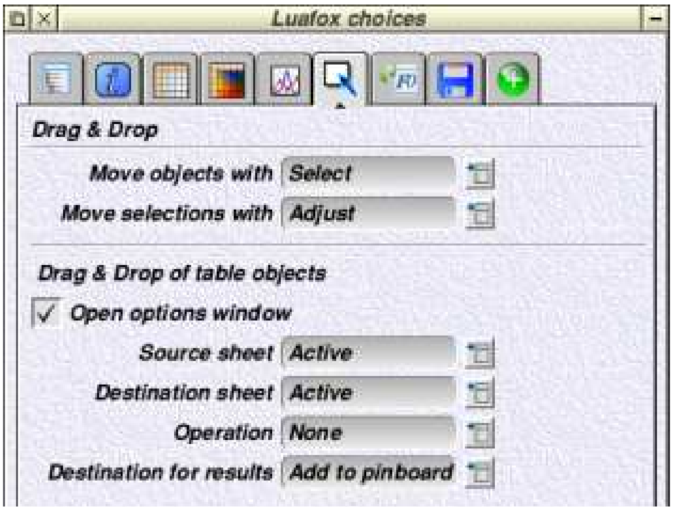
1.16 Drag & Drop

luafox supports Drag & Drop operations to make the program more intuitive. You can drag objects from one Project Manager window and drop in into another one. By default, using the left mouse button (Select) will move the object, using the right button (Adjust) will make a copy of the object at the destination position. The behavior of the mouse buttons can be changed in the program settings ("Move objects with").

Drag & Drop also works with the icons that indicate the sheets of a table. You can drag a sheet of a table to a Project Manager window to move it from the initial Table object to the new place. It will appear as a new table there. Note that if you move the sheet with the left mouse button it will be missing in the initial or source table afterwards. Use the right mouse button to create a copy of the sheet in the Project Manager.

The other way also works: you can add two tables together. By default an options window will open if you drag one table object (the source object) onto another one (the destination object). There you can specify a lot of settings:

1. If you drag the icon of a table (the source table) and it has more than one sheet it is not initially clear which sheet you would like to append, for example, to the destination sheet. You can choose from the first, last or the active sheet or all sheets.



Drag & Drop

Move objects with: Select

Move selections with: Adjust

Drag & Drop of table objects

☑ Open options window

Source sheet: Active

Destination sheet: Active

Operation: None

Destination for results: Add to pinboard

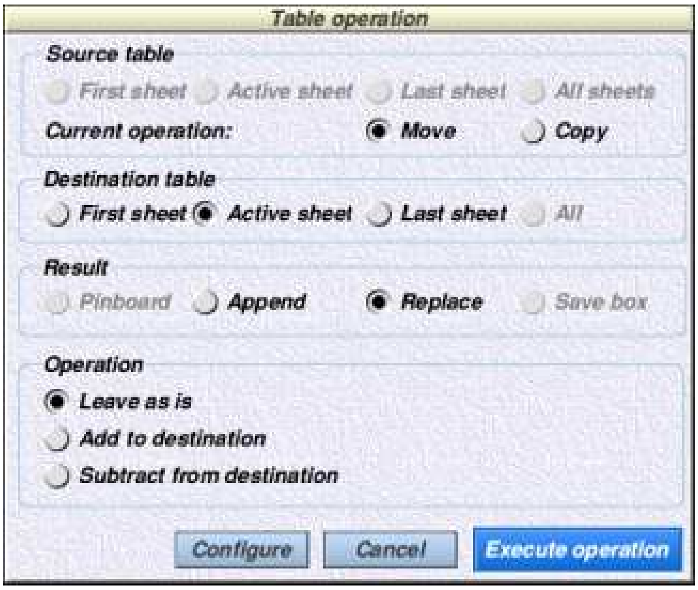
Settings for drag&drop operations

The default setting is to use the active sheet, which is the sheet currently shown in the table window belonging to the source icon. If you drag a sheet instead of the table icon, it is clear which sheet to use and so you cannot set any source options.

2. The current operation option shows whether the source table will be moved (it disappears afterwards) or copied. Which option is preselected depends on the mouse button used as described above.

3. If the destination table has more than one sheet you can also set which of the sheets is used as destination sheet. Again you can choose from first, last, active or all. If you drag the table to a sheet icon the destination options are grayed out because the destination sheet is already fixed.

4. You can specify where the result is stored. The default setting is to append it to the destination sheet. Alternatively you can replace the destination sheet with the result or you can save it in the Pinboard.



Source table

○ First sheet ○ Active sheet ○ Last sheet ○ All sheets

Current operation: ● Move ○ Copy

Destination table

○ First sheet ● Active sheet ○ Last sheet ○ All

Result

○ Pinboard ○ Append ● Replace ○ Save box

Operation

● Leave as is

○ Add to destination

○ Subtract from destination

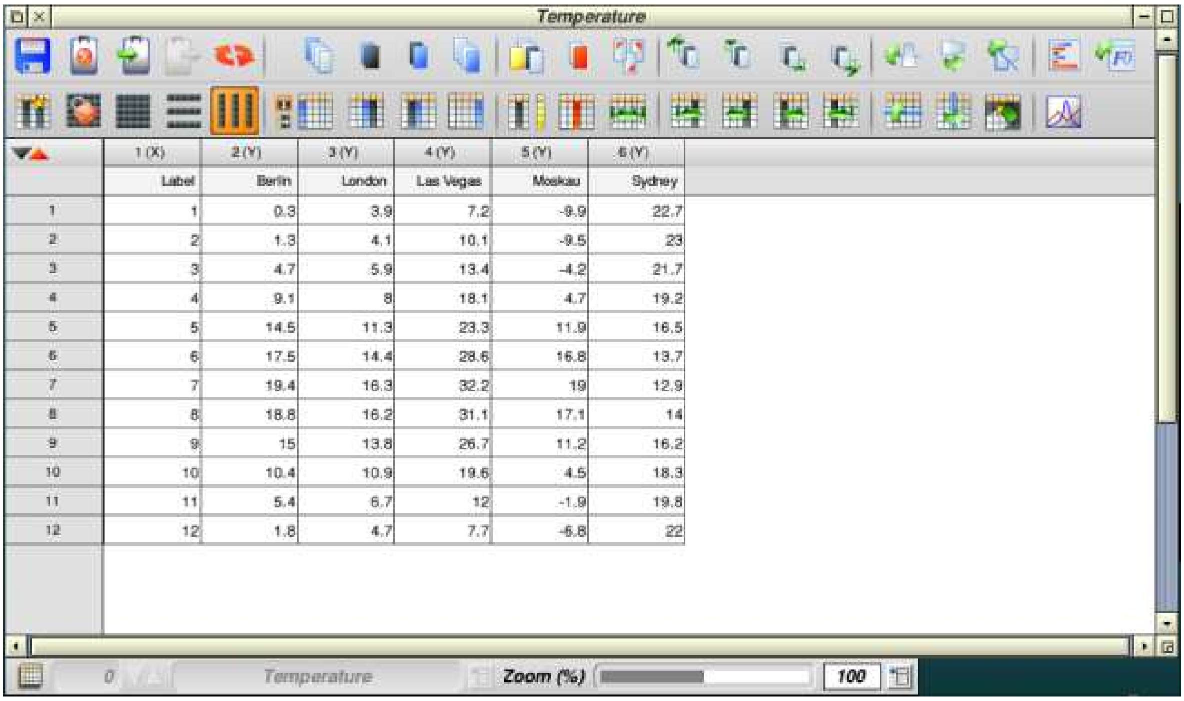
Options window for table operations

5. The operation can be set here. By default the source table is left as is but it is also possible to add it to the destination sheet or subtract the source sheet from the destination sheet. Use this option if you want to add or subtract the values of two tables.

By default the source table will be appended to the destination table. You can change the behavior in the program settings so that no option window will be opened but the favorite operation will be executed instead. By holding down the Alt key the option window will always be opened. This way you can configure a default operation that will be applied in most of the cases. If there is an exception just hold down the Alt key to open the options window which lets you handle the exception easily.

The same is true for functions. They can be applied to whole tables by dragging the function object onto a table object. Here too you can specify in the options window to which sheet the function is applied and where to store the results.

2 Table Windows



	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
	Label	Berlin	London	Las Vegas	Moskau	Sydney
1	1	0.3	3.9	7.2	-9.9	22.7
2	2	1.3	4.1	10.1	-9.5	23
3	3	4.7	5.9	13.4	-4.2	21.7
4	4	9.1	8	18.1	4.7	19.2
5	5	14.5	11.3	23.3	11.9	16.5
6	6	17.5	14.4	28.6	16.8	13.7
7	7	19.4	16.3	32.2	19	12.9
8	8	18.8	16.2	31.1	17.1	14
9	9	15	13.8	26.7	11.2	16.2
10	10	10.4	10.9	19.6	4.5	18.3
11	11	5.4	6.7	12	-1.9	19.8
12	12	1.8	4.7	7.7	-6.8	22

A typical table window in luafox

To open the Table window double click on a table object. Above the data table there is a toolbar which contains all the important functions to manipulate the table and its values. At the bottom of the Table window there is a second toolbar which allows you to switch between sheets. You can just go to the next and previous sheet by using the arrow buttons or choose a sheet from the menu. You can also double click on another sheet of the table in the Project Manager.

The current zoom can be set by the slider, the writeable field or the scale window which opens if you click on the menu button.

2.1 Table options

You can configure the table size and appearance in the main configuration. The first option defines whether the tablewindow opens as soon as you create or load a new table. You can set the default zoom of a table and the window width and height. This is the minimum value that becomes important if you have a table with only a few columns or a low zoom factor and you still want to access the whole toolbar.

The cell width and heights define the default size of the data cells. The column width can be set individually for every column of a table. The height can only be set at this place.

In the second configuration section it is possible to set the default number of sheets, columns and rows for a new table or a new sheet. Also a default value can be specified here. You can use `x,y` and `z` to calculate the cell values or enter another expression such as `rnd(100)` to fill the cells with random numbers.

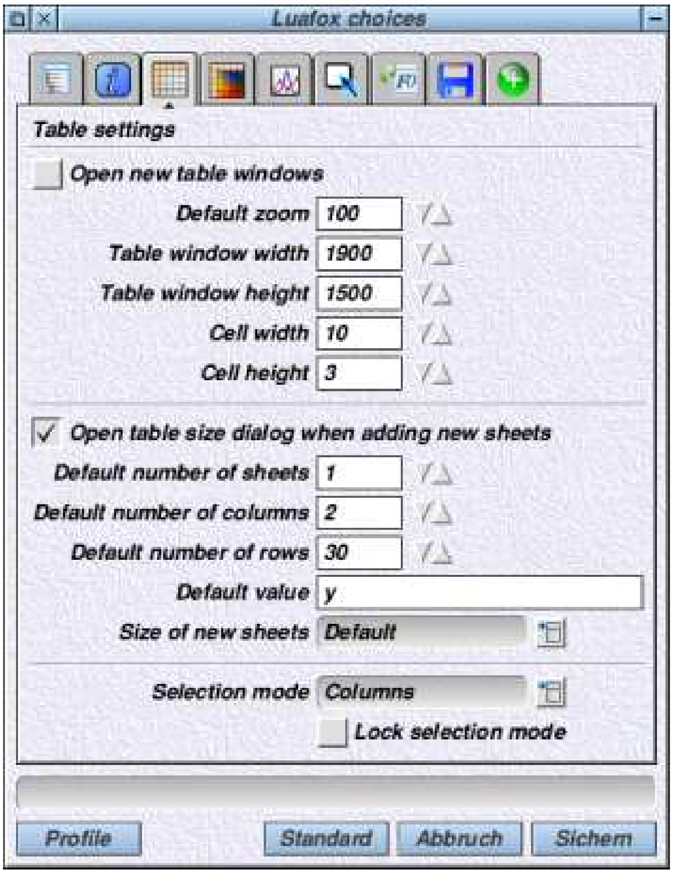


Table settings

□ Open new table windows

Default zoom 100

Table window width 1900

Table window height 1500

Cell width 10

Cell height 3

☑ Open table size dialog when adding new sheets

Default number of sheets 1

Default number of columns 2

Default number of rows 30

Default value y

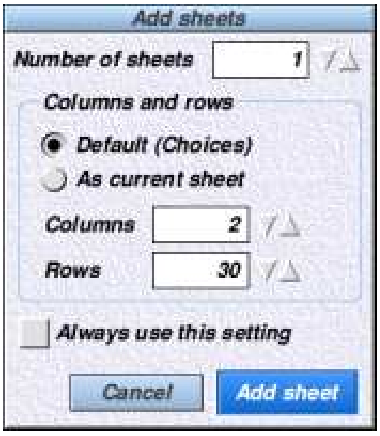
Size of new sheets Default

Selection mode Columns

□ Lock selection mode

Configure size and value settings of tables

You can specify whether you want to open a new dialog box when you insert new sheets into an existing table:



Number of sheets 1

Columns and rows

● Default (Choices)

○ As current sheet

Columns 2

Rows 30

□ Always use this setting

This dialog box appears if you insert new sheets into an existing table and the configuration option to open the dialog box is ticked.

If you insert a new sheet into an existing table there are two default settings for its initial size: either it uses the default values as specified for new tables in the configuration or the number of columns and rows of the current sheet is used. In the dialog box you can switch between both options. Which one is the default setting can also be defined in the configuration using the option "Size of new sheets".

If you tick the "Always use this setting" option this dialog box will no longer be opened by default. This allows you to add sheets more quickly without the need to confirm the settings every time. However, if you want to open the dialog box in one case just hold down the Alt key while you press one of the buttons to insert a new sheet.

In the last section of the configuration window you can choose the default selection mode and specify whether you would like to lock this mode by default.

2.2 Table style

The appearance of the table can be configured in many ways.

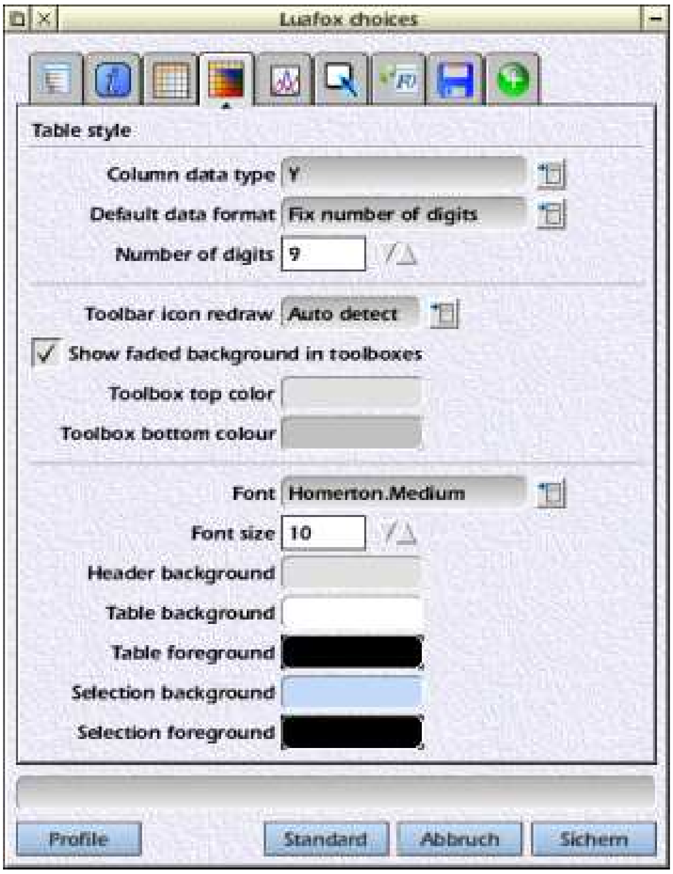


Table style

Column data type: Y

Default data format: Fix number of digits

Number of digits: 9

Toolbar icon redraw: Auto detect

✓ Show faded background in toolboxes

Toolbox top color

Toolbox bottom colour

Font: Homerton.Medium

Font size: 10

Header background

Table background

Table foreground

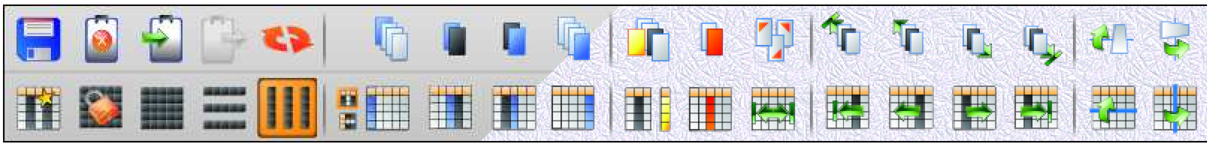
Selection background

Selection foreground

Configure the table style

You can set a default column data type and the number format that defines how numbers are shown in the table window. Using the main configuration also allows you to set the font and font size. All tables will show the same font and font size; they cannot be specified individually for different tables.

There is an option to redraw the toolbar icons. Some versions of the toolbox, which is used to display icons and windows as well as other desktop objects, do not redraw the icons correctly so this has to be done by luafox. These problems have been solved in newer versions supplied with RISC OS Select. If the setting is set to "Auto detect" luafox will not try to redraw the icons by itself on RISC OS 6. You can try to set it off and see whether the orange background, which appears when a button is pressed, will remain after releasing it.

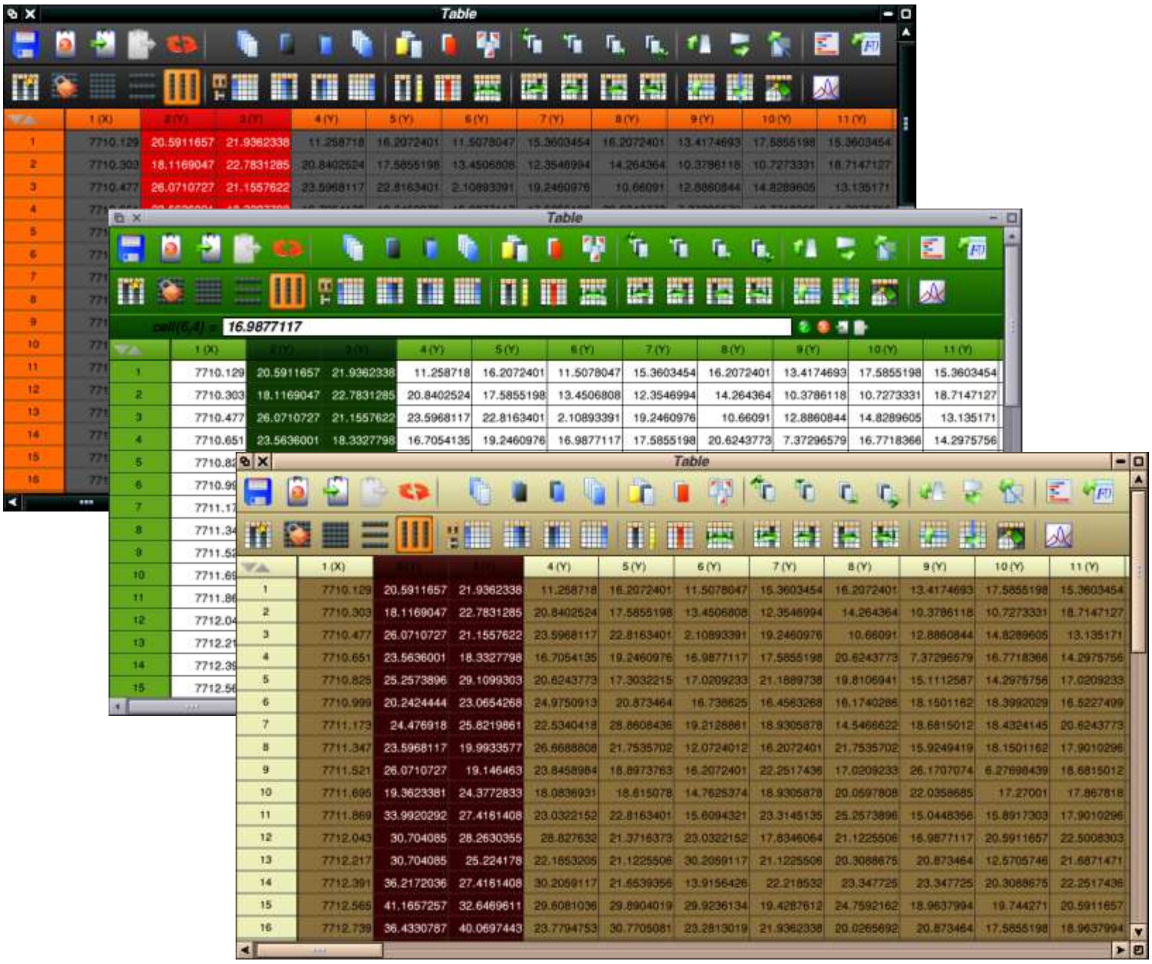


Toolbar with and without faded background

The rest of the settings influence the coloring of the table window and toolboxes. You can choose whether you want to display a faded background in toolboxes or use the default background of the desktop.

Note that the faded background may slow down redrawing on older machines.

With the other settings you can adjust luafox to your desktop theme:



cell(6,4) = 16.9877117

	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)	7 (Y)	8 (Y)	9 (Y)	10 (Y)	11 (Y)
1	7710.129	20.5911657	21.9362338	11.258718	16.2072401	11.5078047	15.3603454	16.2072401	13.4174693	17.5855198	15.3603454
2	7710.303	18.1169047	22.7831285	20.8402524	17.5855198	13.4506808	12.3546994	14.264364	10.3786118	10.7273331	18.7147127
3	7710.477	26.0710727	21.1557622	23.5968117	22.8163401	2.10893391	19.2460976	10.66091	12.8860844	14.8289605	13.135171
4	7710.651	23.5636001	18.3327798	16.7054135	19.2460976	16.9877117	17.5855198	20.6243773	7.37296579	16.7718366	14.2975756
5	7710.825	25.2573896	29.1099303	20.6243773	17.3032215	17.0209233	21.1889738	19.8106941	15.1112587	14.2975756	17.0209233
6	7710.999	20.2424444	23.0654268	24.9750913	20.873464	16.738625	16.4563268	16.1740286	18.1501162	18.3992029	16.5227499
7	7711.173	24.476918	25.8219861	22.5340418	28.8608436	19.2128861	18.9305878	14.5466622	18.6815012	18.4324145	20.6243773
8	7711.347	23.5968117	19.9933577	26.6688808	21.7535702	12.0724012	16.2072401	21.7535702	15.9249419	18.1501162	17.9010296
9	7711.521	26.0710727	19.146463	23.8458984	18.8973763	16.2072401	22.2517436	17.0209233	26.1707074	6.27698439	18.6815012
10	7711.695	19.3623381	24.3772833	18.0836931	18.615078	14.7625374	18.9305878	20.0597808	22.0358685	17.27001	17.867818
11	7711.869	33.9920292	27.4161408	23.0322152	22.8163401	15.6094321	23.3145135	25.2573896	15.0448356	15.8917303	17.9010296
12	7712.043	30.704085	28.2630355	28.827632	21.3716373	23.0322152	17.8346064	21.1225506	16.9877117	20.5911657	22.5008303
13	7712.217	30.704085	25.224178	22.1853205	21.1225506	30.2059117	21.1225506	20.3088675	20.873464	12.5705746	21.6871471
14	7712.391	36.2172036	27.4161408	30.2059117	21.6539356	13.9156426	22.218532	23.347725	23.347725	20.3088675	22.2517436
15	7712.565	41.1657257	32.6469611	29.6081036	29.8904019	29.9236134	19.4287612	24.7592162	18.9637994	19.744271	20.5911657
16	7712.739	36.4330787	40.0697443	23.7794753	30.7705081	23.2813019	21.9362338	20.0265692	20.873464	17.5855198	18.9637994

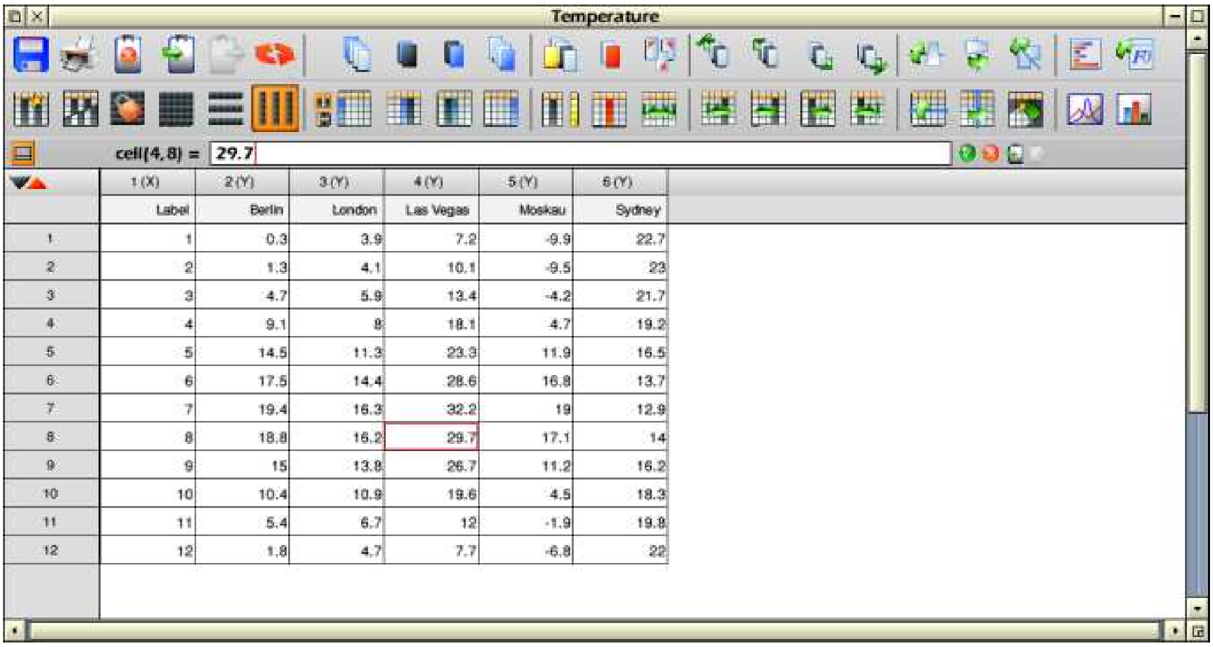
Use the table style settings to adjust the appearance of luafox to your preferences of your favorite desktop theme.

Hint for advanced users using RISC OS Select who know how to use ResEdit: The color of faded icons depends on the window background. If you change the background of the toolbox windows of the Res file inside luafox (please make a backup copy first) to a color that closely matches the colors used in the toolbox, faded icons really look amazing.

2.3 Changing values

To change the value of a cell just double click on it, and the toolbox at the top will open a writeable field where you can enter an expression. Note that the expression is always calculated immediately and not stored inside the field as in a spreadsheet. You can access other objects (numbers, constants, tables) from here as well as entering a number, string. Also x,y and z are defined as columns, rows and sheets respectively. To accept a value press enter or click on the green tick next to the writeable field. If enter is pressed the entry marker (red box) is moved to the field below the current one.

Use tab to jump to the right instead, or shift-tab to go to the left. You can also use the arrow keys if you keep the ctrl key pressed (up and down also works without ctrl key).



cell(4,8) = 29.7

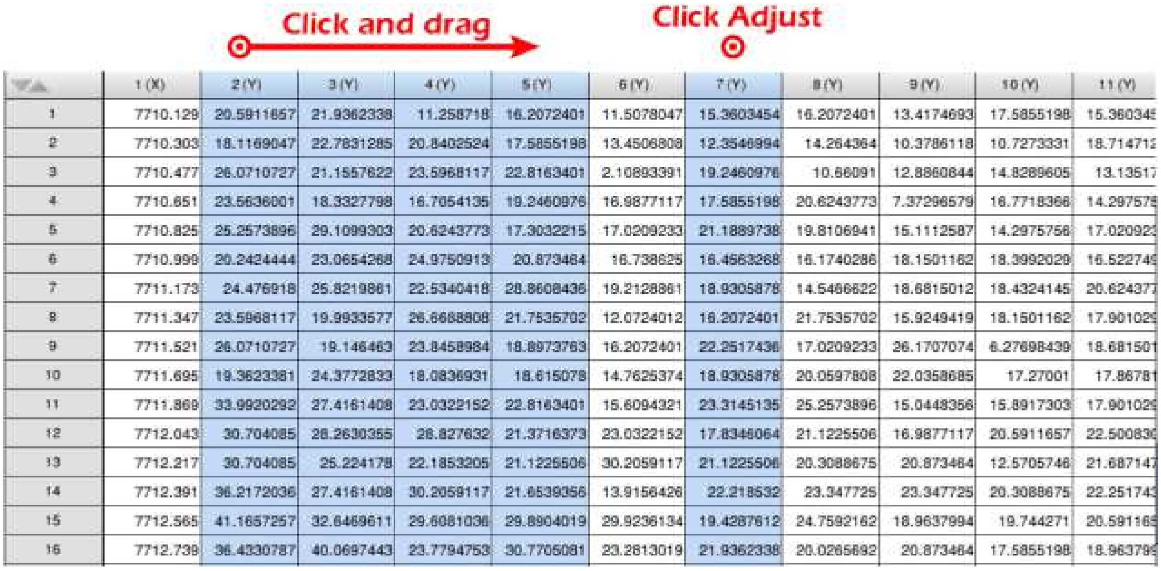
	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
	Label	Berlin	London	Las Vegas	Moskau	Sydney
1	1	0.3	3.9	7.2	-9.9	22.7
2	2	1.3	4.1	10.1	-9.5	23
3	3	4.7	5.9	13.4	-4.2	21.7
4	4	9.1	8	18.1	4.7	19.2
5	5	14.5	11.3	23.3	11.9	16.5
6	6	17.5	14.4	28.6	16.8	13.7
7	7	19.4	16.3	32.2	19	12.9
8	8	18.8	16.2	29.7	17.1	14
9	9	15	13.8	26.7	11.2	16.2
10	10	10.4	10.9	19.6	4.5	18.3
11	11	5.4	6.7	12	-1.9	19.8
12	12	1.8	4.7	7.7	-6.8	22

Change table values by double clicking them

Next to the writeable field there are three more icons. The red x can be used to omit the changes. Pressing the Escape key has the same effect. There are also two clipboard icons that can be used to copy the current value into the clipboard or paste it from the clipboard. This can be used to copy a value quickly from one cell to another. On the left hand side of the writeable field is a button to keep the writeable field always open, even when no cell is selected (indtroduced in luafox 1.50).

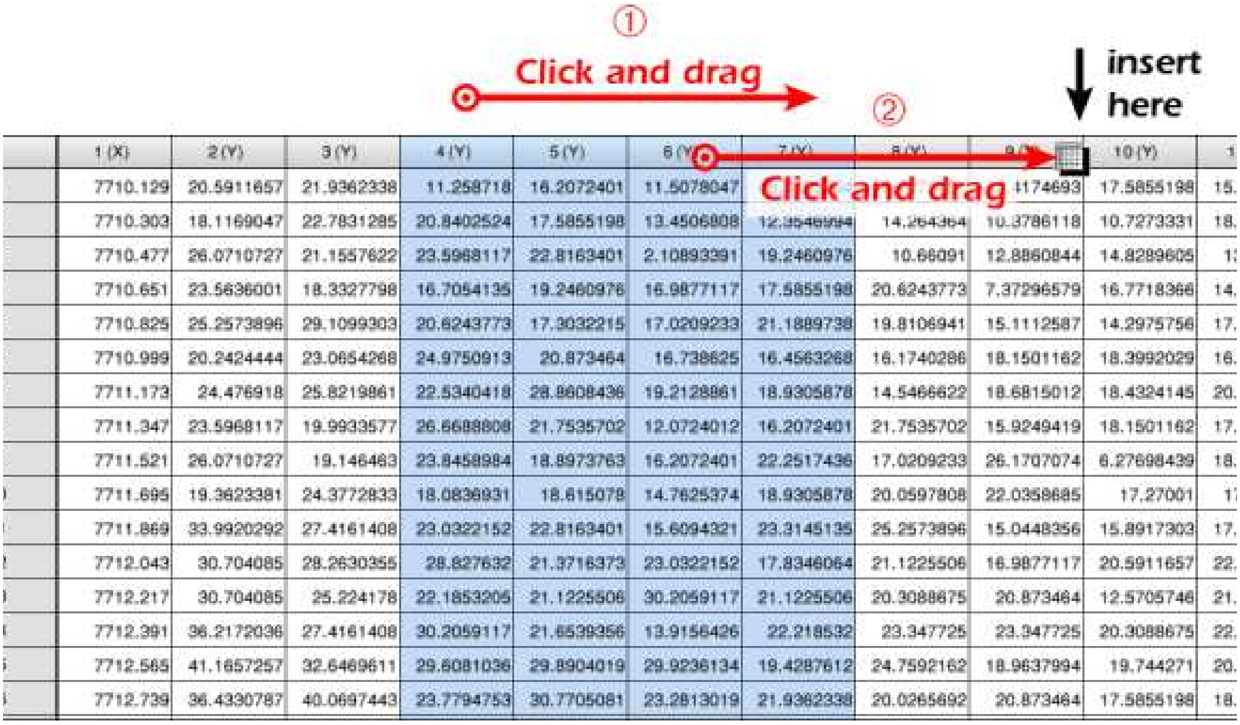
2.4 Selections

You can select a column if you click with the left mouse button on the top of it. Select a number of columns by pressing the mouse button on top of a column and move it to the left or right while keeping the mouse button pressed. The window will move if you drag beyond its edges. Alternatively you can use the right mouse button (or left + ctrl key) to add individual columns or a number of columns. To select columns in a large table select the first column by clicking on it. Use the window slider to move to the last column you want to select and hold down the shift key by clicking with the left mouse button on it.



▼▲	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)	7 (Y)	8 (Y)	9 (Y)	10 (Y)	11 (Y)
1	7710.129	20.5911657	21.9362338	11.258718	16.2072401	11.5078047	15.3603454	16.2072401	13.4174693	17.5855198	15.360345
2	7710.303	18.1169047	22.7831285	20.8402524	17.5855198	13.4506808	12.3546994	14.264364	10.3786118	10.7273331	18.71471
3	7710.477	26.0710727	21.1557622	23.5968117	22.8163401	2.10893391	19.2460976	10.66091	12.8860844	14.8289605	13.13517
4	7710.651	23.5636001	18.3327798	16.7054135	19.2460976	16.9877117	17.5855198	20.6243773	7.37296579	16.7718366	14.29757
5	7710.825	25.2573896	29.1099303	20.6243773	17.3032215	17.0209233	21.1889738	19.8106941	15.1112587	14.2975756	17.02092
6	7710.999	20.2424444	23.0654268	24.9750913	20.873464	16.738625	16.4563268	16.1740286	18.1501162	18.3992029	16.52274
7	7711.173	24.476918	25.8219861	22.5340418	28.8608436	19.2128861	18.9305878	14.5466622	18.6815012	18.4324145	20.62437
8	7711.347	23.5968117	19.9933577	26.6688808	21.7535702	12.0724012	16.2072401	21.7535702	15.9249419	18.1501162	17.90102
9	7711.521	26.0710727	19.146463	23.8458984	18.8973763	16.2072401	22.2517436	17.0209233	26.1707074	6.27698439	18.681501
10	7711.695	19.3623381	24.3772833	18.0836931	18.615078	14.7625374	18.9305878	20.0597808	22.0358685	17.27001	17.86781
11	7711.869	33.9920292	27.4161408	23.0322152	22.8163401	15.6094321	23.3145135	25.2573896	15.0448356	15.8917303	17.90102
12	7712.043	30.704085	28.2630355	28.827632	21.3716373	23.0322152	17.8346064	21.1225506	16.9877117	20.5911657	22.50083
13	7712.217	30.704085	25.224178	22.1853205	21.1225506	30.2059117	21.1225506	20.3088675	20.873464	12.5705746	21.68714
14	7712.391	36.2172036	27.4161408	30.2059117	21.6539356	13.9156426	22.218532	23.347725	23.347725	20.3088675	22.25174
15	7712.565	41.1657257	32.6469611	29.6081036	29.8904019	29.9236134	19.4287612	24.7592162	18.9637994	19.744271	20.59116
16	7712.739	36.4330787	40.0697443	23.7794753	30.7705081	23.2813019	21.9362338	20.0265692	20.873464	17.5855198	18.96379

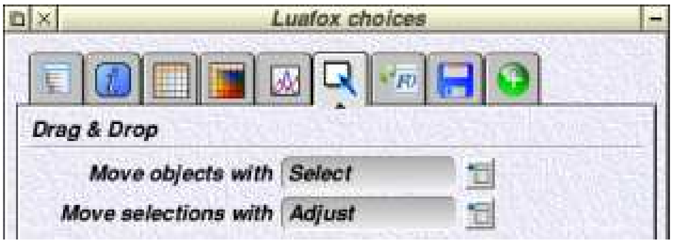
Click a mouse button and drag to select columns, use Adjust to add more columns



1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y	7 (Y)	8 (Y)	9 (	10 (Y)	1
7710.129	20.5911657	21.9362338	11.258718	16.2072401	11.5078047			174693	17.5855198	15.
7710.303	18.1169047	22.7831285	20.8402524	17.5855198	13.4506808	12.3546994	14.264364	10.3786118	10.7273331	18.
7710.477	26.0710727	21.1557622	23.5968117	22.8163401	2.10893391	19.2460976	10.66091	12.8860844	14.8289605	1
7710.651	23.5636001	18.3327798	16.7054135	19.2460976	16.9877117	17.5855198	20.6243773	7.37296579	16.7718366	14.
7710.825	25.2573896	29.1099303	20.6243773	17.3032215	17.0209233	21.1889738	19.8106941	15.1112587	14.2975756	17.
7710.999	20.2424444	23.0654268	24.9750913	20.873464	16.738625	16.4563268	16.1740286	18.1501162	18.3992029	16.
7711.173	24.476918	25.8219861	22.5340418	28.8608436	19.2128861	18.9305878	14.5466622	18.6815012	18.4324145	20.
7711.347	23.5968117	19.9933577	26.6688808	21.7535702	12.0724012	16.2072401	21.7535702	15.9249419	18.1501162	17.
7711.521	26.0710727	19.146463	23.8458984	18.8973763	16.2072401	22.2517436	17.0209233	26.1707074	6.27698439	18.
7711.695	19.3623381	24.3772833	18.0836931	18.615078	14.7625374	18.9305878	20.0597808	22.0358685	17.27001	1
7711.869	33.9920292	27.4161408	23.0322152	22.8163401	15.6094321	23.3145135	25.2573896	15.0448356	15.8917303	17.
7712.043	30.704085	28.2630355	28.827632	21.3716373	23.0322152	17.8346064	21.1225506	16.9877117	20.5911657	22.
7712.217	30.704085	25.224178	22.1853205	21.1225506	30.2059117	21.1225506	20.3088675	20.873464	12.5705746	21.
7712.391	36.2172036	27.4161408	30.2059117	21.6539356	13.9156426	22.218532	23.347725	23.347725	20.3088675	22.
7712.565	41.1657257	32.6469611	29.6081036	29.8904019	29.9236134	19.4287612	24.7592162	18.9637994	19.744271	20.
7712.739	36.4330787	40.0697443	23.7794753	30.7705081	23.2813019	21.9362338	20.0265692	20.873464	17.5855198	18.

1. Click and drag to select a number of columns you want to move
2. Click on one of these columns and drag it to move it inside the sheet

If you click and hold a column that is already selected you can move the data. If you drag it to another position in the table the columns will be moved there. If you drag to the Project Manager the data will either be moved or copied into a new table, depending on the mouse buttons used. Note that you can specify a different mouse button for moving data around from that given inside the Project Manager in the program settings.



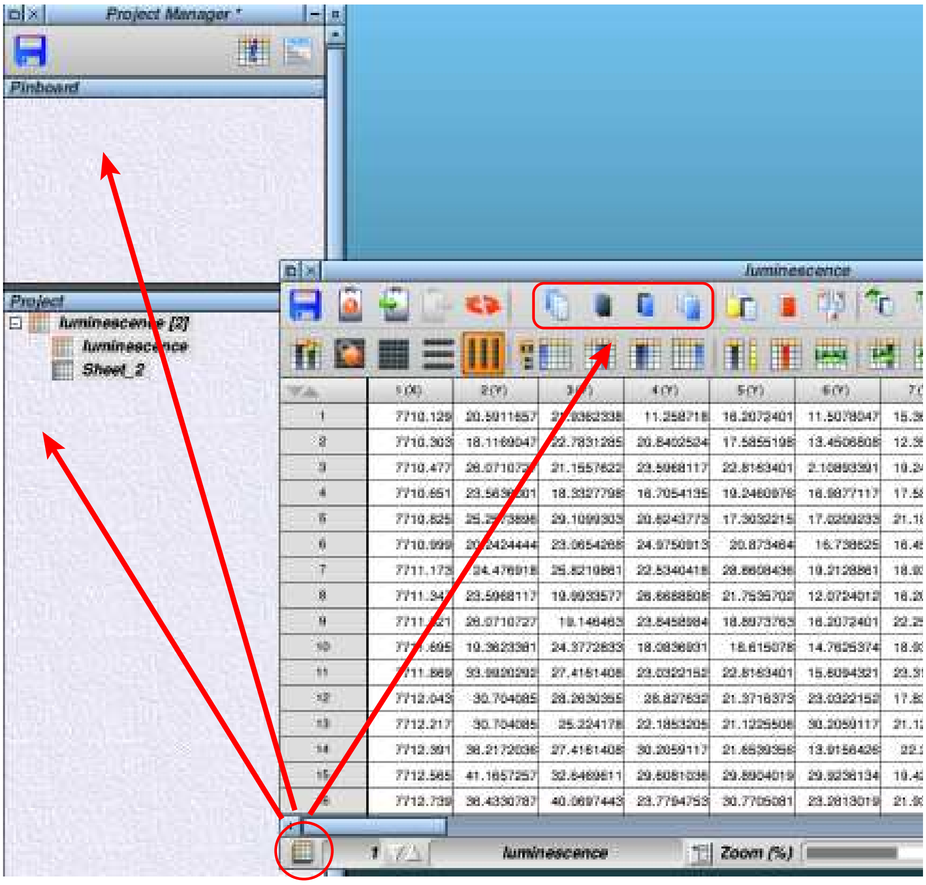
Drag & Drop

Move objects with Select

Move selections with Adjust

Define the mouse button for copying and moving selection in the configuration

You can also use the small table icon in the bottom toolbox to save a copy of the table somewhere. You can also drag it to the four insert sheet buttons in the main toolbox, e.g. to append a copy of the current sheet to the table. This is very useful if you want to change the data in the table but want to keep a copy of the original data. Note than you can also drag it to the insert sheet buttons of another table window to insert the current sheet there.



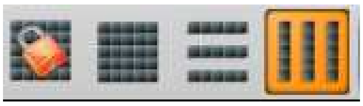
▼▲	1(X)	2(Y)	3(Y)	4(Y)	5(Y)	6(Y)	7(
1	7710.129	20.5911657	21.0362338	11.258718	18.2072401	11.5078047	15.3
2	7710.303	18.1169047	22.7831285	20.8402524	17.5855198	13.4506508	12.3
3	7710.477	28.0710727	21.1557622	23.5968117	22.8163401	2.10893391	19.2
4	7710.651	23.5636601	18.3327798	16.7054135	19.2460976	16.9877117	17.5
5	7710.825	25.2573896	29.1099303	20.6243773	17.3032215	17.0209233	21.1
6	7710.999	20.2424444	23.0654268	24.9750913	20.873464	16.738625	16.4
7	7711.173	24.476918	25.8219861	22.5340418	28.8608436	19.2128861	18.0
8	7711.347	23.5968117	19.9933577	26.6688508	21.7535702	12.0724012	16.2
9	7711.521	28.0710727	19.148463	23.8458984	18.8973763	16.2072401	22.2
10	7711.695	19.3623381	24.3772633	18.0836931	18.615078	14.7625374	18.9
11	7711.869	33.9920292	27.4161408	23.0322152	22.8163401	15.6094321	23.3
12	7712.043	30.704085	28.2630365	26.827632	21.3716373	23.0322152	17.8
13	7712.217	30.704085	25.224178	22.1853205	21.1225506	30.2059117	21.1
14	7712.391	38.2172036	27.4161408	30.2059117	21.6539356	13.9156426	22.
15	7712.565	41.1657257	32.6469611	29.6081036	29.8904019	29.9236134	19.4
16	7712.739	38.4330787	40.0697443	23.7794753	30.7705081	23.2813019	21.9

Move the table icon to the Project Manager or one of the "Insert sheet" icons

Note that everything described above is also valid when dealing with rows. You can select rows in the same way and also use drag & drop to move or copy them.

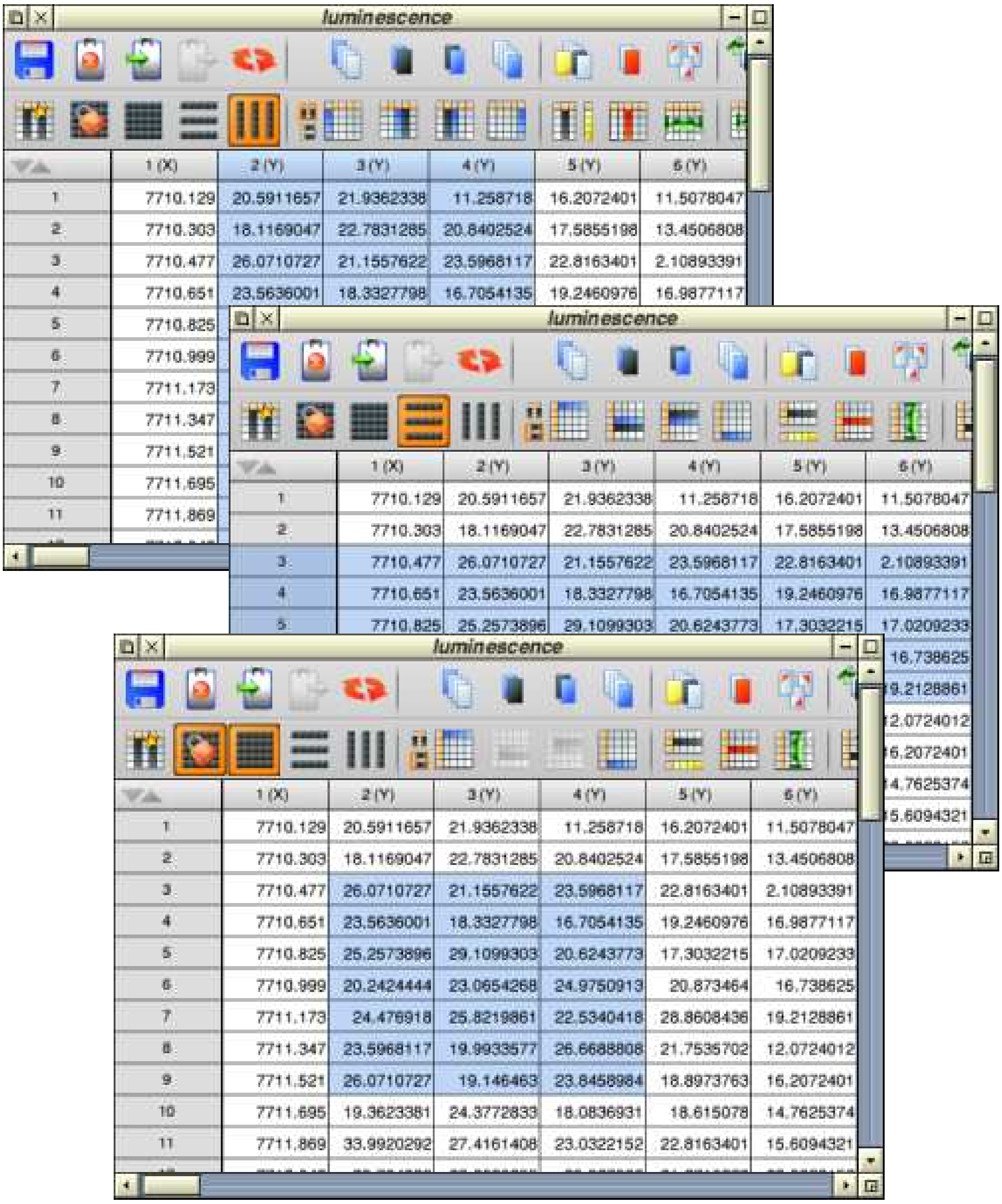
It is also possible to select a block of data if the drag starts in the main part of the table. A block selection can also be copied to the Project Manager.

Click with the left mouse button in the corner of the table to select it as a whole. Click with the right button to deselect the table. You can remove the current selection by right clicking in the main table.



Use these buttons to set the selection mode

If you select columns, rows or blocks of data you will notice that the selection mode changes. Usually the selection mode will be identical to the selection you made. If you select a number of columns, the selection mode will be set to columns and change to rows once you select rows. The selection mode does not show what you have selected but instead defines how the selection will be treated when a function is applied to it.



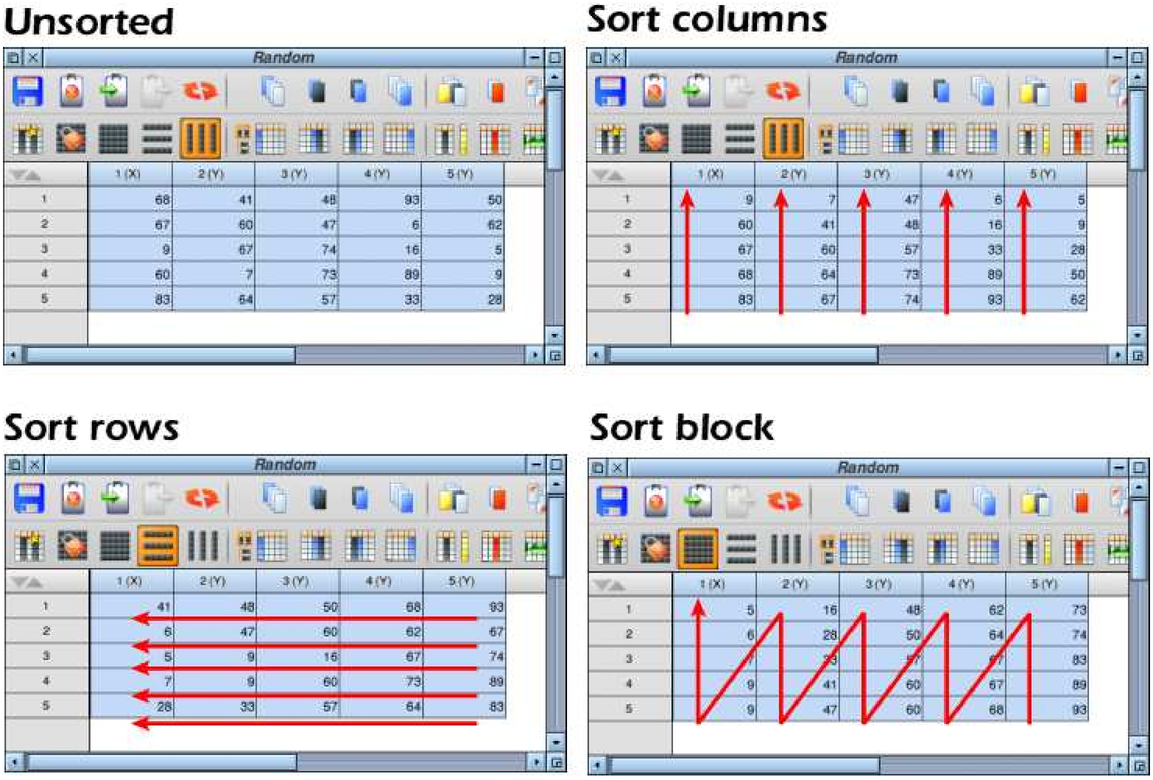
	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
1	7710.129	20.5911657	21.9362338	11.258718	16.2072401	11.5078047
2	7710.303	18.1169047	22.7831285	20.8402524	17.5855198	13.4506808
3	7710.477	26.0710727	21.1557622	23.5968117	22.8163401	2.10893391
4	7710.651	23.5636001	18.3327798	16.7054135	19.2460976	16.9877117
5	7710.825					
6	7710.999					
7	7711.173					
8	7711.347					
9	7711.521					
10	7711.695					
11	7711.869					

	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
1	7710.129	20.5911657	21.9362338	11.258718	16.2072401	11.5078047
2	7710.303	18.1169047	22.7831285	20.8402524	17.5855198	13.4506808
3	7710.477	26.0710727	21.1557622	23.5968117	22.8163401	2.10893391
4	7710.651	23.5636001	18.3327798	16.7054135	19.2460976	16.9877117
5	7710.825	25.2573896	29.1099303	20.6243773	17.3032215	17.0209233
						16.738625
						9.2128861
						2.0724012
						6.2072401
						4.7625374
						5.6094321

	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
1	7710.129	20.5911657	21.9362338	11.258718	16.2072401	11.5078047
2	7710.303	18.1169047	22.7831285	20.8402524	17.5855198	13.4506808
3	7710.477	26.0710727	21.1557622	23.5968117	22.8163401	2.10893391
4	7710.651	23.5636001	18.3327798	16.7054135	19.2460976	16.9877117
5	7710.825	25.2573896	29.1099303	20.6243773	17.3032215	17.0209233
6	7710.999	20.2424444	23.0654268	24.9750913	20.873464	16.738625
7	7711.173	24.476918	25.8219861	22.5340418	28.8608436	19.2128861
8	7711.347	23.5968117	19.9933577	26.6688808	21.7535702	12.0724012
9	7711.521	26.0710727	19.146463	23.8458984	18.8973763	16.2072401
10	7711.695	19.3623381	24.3772833	18.0836931	18.615078	14.7625374
11	7711.869	33.9920292	27.4161408	23.0322152	22.8163401	15.6094321

If the selection mode is not locked it will change according to the selection made

A good example is the sort function. Let's assume that there is a number of columns selected and the selection mode is also set to columns. The sort function will now sort the values of the columns individually. If the same columns are selected but now the selection mode is set to "block", the sort function behaves differently. Now the data values of the columns are treated as one block of data and sorting will also exchange values between columns so that in the end e.g. the first selected column will contain the lowest values of all previously selected columns. The sort function is described in more detail in a separate section.



Unsorted

Random

	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)
1	68	41	48	93	50
2	67	60	47	6	62
3	9	67	74	16	5
4	60	7	73	89	9
5	83	64	57	33	28

Sort columns

Random

	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)
1	9	7	47	6	5
2	60	41	48	16	9
3	67	60	57	33	28
4	68	64	73	89	50
5	83	67	74	93	62

Sort rows

Random

	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)
1	41	48	50	68	93
2	6	47	60	62	67
3	5	9	16	67	74
4	7	9	60	73	89
5	28	33	57	64	83

Sort block

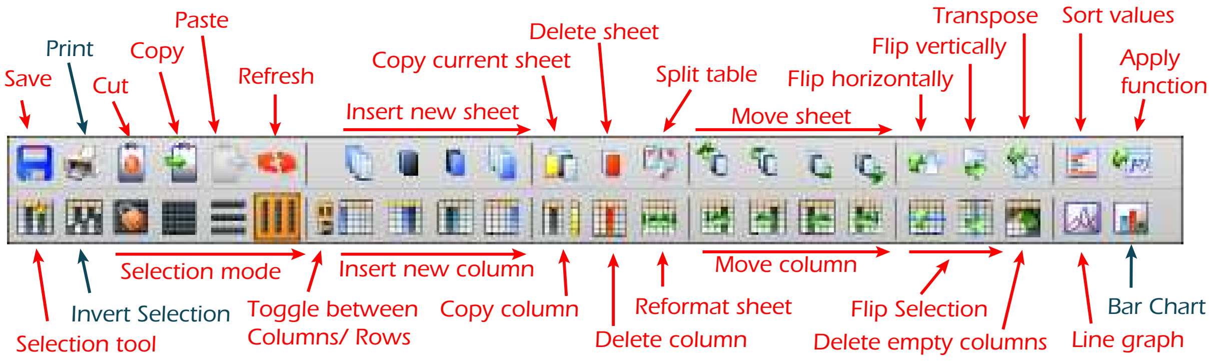
Random

	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)
1	5	16	48	62	73
2	6	28	50	64	74
3	7	33	57	67	83
4	9	41	60	67	89
5	9	47	60	68	93

In all cases shown, five columns are selected. Depending on the setting of the selection mode the sort function works differently

To avoid the automatic changing of the selection mode you can lock it. Now you can change it only manually. Changes to the selection mode do not only affect the sort function but also all mathematical functions applied to the table.

2.5 Main toolbar

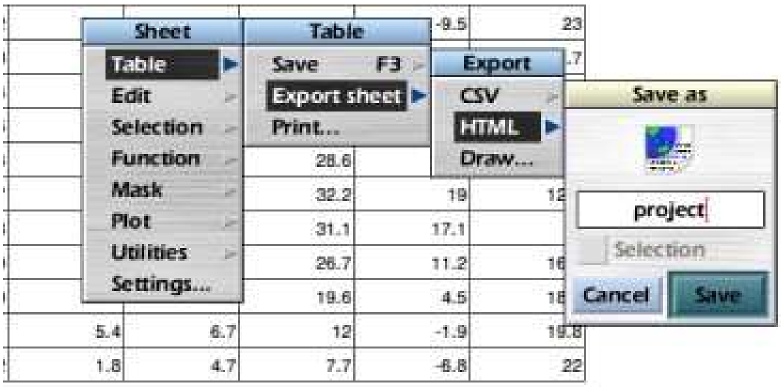


Overview of the main table toolbox

The main toolbar contains several icons to change the table object or its values. The colors in the icons have a special meaning. Blue will always add something. Yellow will copy and red will change the table or the values and green will move or reorder the values.

2.5.1 Saving

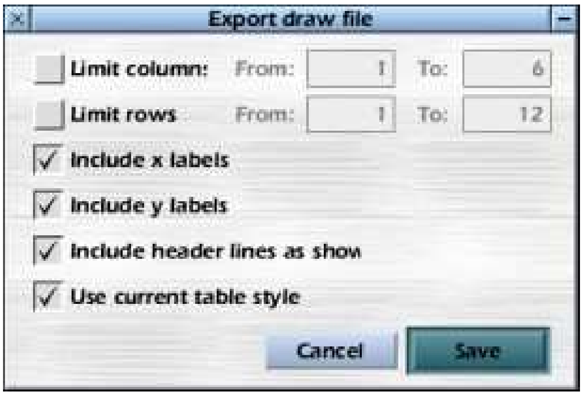
Use the save button to open the save dialog box and drag the icon to a filer window to save it. The table will be saved in the open document spreadsheet (ODS) format. Clicking Adjust will open a filer window of the current project path. Use the Table menu to export data in the CSV, HTML or Draw format.



You can export tables as CSV, HTML or Draw file

The CSV and HTML export options will only save the data values. These formats do not recover any styles and formulars used in the original table. The save dialog box allows you to save only the selected data.

Exporting a table in draw format has been enhanced in luafox 1.2: The numbers of rows and columns can be limited. It is also possible to in- or exclude x and y labels as well as the currently shown header lines. Tables can be exported either in black and while or with the colors defined in the current table style.



Export draw file

☐ Limit column: From: 1 To: 6

☐ Limit rows From: 1 To: 12

☑ Include x labels

☑ Include y labels

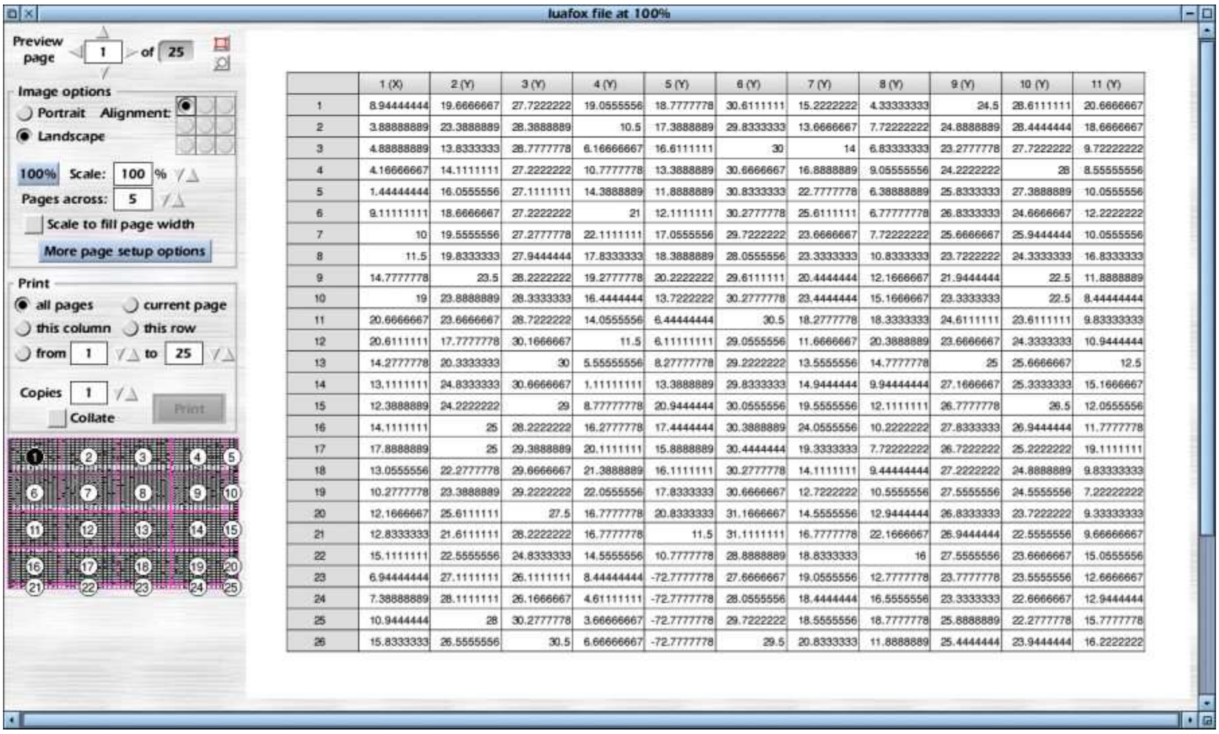
☑ Include header lines as show

☑ Use current table style

Export a table as draw file

2.5.2 Printing (introduced in V1.20)

For printing luafox uses the excellent !DrawPrint application which is supplied with it thanks to the kind permission of the author. When the print button is pressed a dialog very similar to the draw export dialog is shown. This is because a table is converted into a draw file which is then send to the !DrawPrint application. !DrawPrint does not have to be started before you try to print but needs to have been seen by the filer, otherwise the print icon is greyed out.



luafox file at 100%

Preview page 1 of 25

Image options

○ Portrait Alignment:

● Landscape

100% Scale: 100 %

Pages across: 5

☐ Scale to fill page width

Print

● all pages ○ current page

○ this column ○ this row

○ from 1 to 25

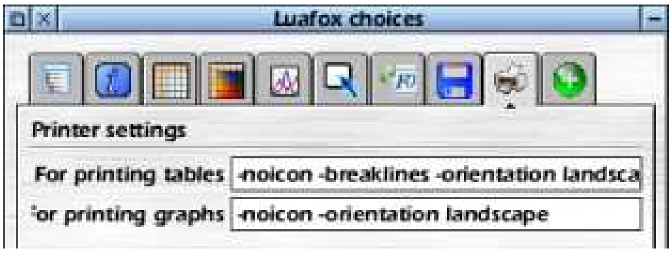
Copies 1

☐ Collate

	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)	7 (Y)	8 (Y)	9 (Y)	10 (Y)	11 (Y)
1	8.94444444	19.6666667	27.7222222	19.0555556	18.7777778	30.6111111	15.2222222	4.33333333	24.5	28.6111111	20.6666667
2	3.88888889	23.3888889	28.3888889	10.5	17.3888889	29.8333333	13.6666667	7.72222222	24.8888889	28.4444444	18.6666667
3	4.88888889	13.8333333	28.7777778	6.16666667	16.6111111	30	14	6.83333333	23.2777778	27.7222222	9.72222222
4	4.16666667	14.1111111	27.2222222	10.7777778	13.3888889	30.6666667	16.8888889	9.05555556	24.2222222	28	8.55555556
5	1.44444444	16.0555556	27.1111111	14.3888889	11.8888889	30.8333333	22.7777778	6.38888889	25.8333333	27.3888889	10.0555556
6	9.11111111	18.6666667	27.2222222	21	12.1111111	30.2777778	25.6111111	6.77777778	26.8333333	24.6666667	12.2222222
7	10	19.5555556	27.2777778	22.1111111	17.0555556	29.7222222	23.6666667	7.72222222	25.6666667	25.9444444	10.0555556
8	11.5	19.8333333	27.9444444	17.8333333	18.3888889	28.0555556	23.3333333	10.8333333	23.7222222	24.3333333	16.8333333
9	14.7777778	23.5	28.2222222	19.2777778	20.2222222	29.6111111	20.4444444	12.1666667	21.9444444	22.5	11.8888889
10	19	23.8888889	28.3333333	16.4444444	13.7222222	30.2777778	23.4444444	15.1666667	23.3333333	22.5	8.44444444
11	20.6666667	23.6666667	28.7222222	14.0555556	6.44444444	30.5	18.2777778	18.3333333	24.6111111	23.6111111	9.83333333
12	20.6111111	17.7777778	30.1666667	11.5	6.11111111	29.0555556	11.6666667	20.3888889	23.6666667	24.3333333	10.9444444
13	14.2777778	20.3333333	30	5.55555556	8.27777778	29.2222222	13.5555556	14.7777778	25	25.6666667	12.5
14	13.1111111	24.8333333	30.6666667	1.11111111	13.3888889	29.8333333	14.9444444	9.94444444	27.1666667	25.3333333	15.1666667
15	12.3888889	24.2222222	29	8.77777778	20.9444444	30.0555556	19.5555556	12.1111111	26.7777778	26.5	12.0555556
16	14.1111111	25	28.2222222	16.2777778	17.4444444	30.3888889	24.0555556	10.2222222	27.8333333	26.9444444	11.7777778
17	17.8888889	25	29.3888889	20.1111111	15.8888889	30.4444444	19.3333333	7.72222222	26.7222222	25.2222222	19.1111111
18	13.0555556	22.2777778	29.6666667	21.3888889	16.1111111	30.2777778	14.1111111	9.44444444	27.2222222	24.8888889	9.83333333
19	10.2777778	23.3888889	29.2222222	22.0555556	17.8333333	30.6666667	12.7222222	10.5555556	27.5555556	24.5555556	7.22222222
20	12.1666667	25.6111111	27.5	16.7777778	20.8333333	31.1666667	14.5555556	12.9444444	26.8333333	23.7222222	9.33333333
21	12.8333333	21.6111111	28.2222222	16.7777778	11.5	31.1111111	16.7777778	22.1666667	26.9444444	22.5555556	9.66666667
22	15.1111111	22.5555556	24.8333333	14.5555556	10.7777778	28.8888889	18.8333333	16	27.5555556	23.6666667	15.0555556
23	6.94444444	27.1111111	26.1111111	8.44444444	-72.7777778	27.6666667	19.0555556	12.7777778	23.7777778	23.5555556	12.6666667
24	7.38888889	28.1111111	26.1666667	4.61111111	-72.7777778	28.0555556	18.4444444	16.5555556	23.3333333	22.6666667	12.9444444
25	10.9444444	28	30.2777778	3.66666667	-72.7777778	29.7222222	18.5555556	18.7777778	25.8888889	22.2777778	15.7777778
26	15.8333333	26.5555556	30.5	6.66666667	-72.7777778	29.5	20.8333333	11.8888889	25.4444444	23.9444444	16.2222222

Main window of !DrawPrint showing a luafox table

!DrawPrint allows you to print large tables on many sheets as shown in the above screenshot. You can choose the scale of the table, whether it will pe printed in Portrait or Landscape mode and much more. !DrawPrint has been extended to cut tables along horizontal or vertical lines, so that the content of one row or column is not split over two tables. In the main configuration you can set options for !DrawPrint:



Printer settings

For printing tables -noicon -breaklines -orientation landsca

'or printing graphs -noicon -orientation landscape

Main choices: Printer settings

The default setting is to show no iconbar icon and close the application automatically when the print job is done. Also tables will be split at lines and the default orientation is set to landscape. !DrawPrint offers many more options. Please refer to the manual supplied with the application. The current version of !DrawPrint is 1.25, luafox support was added in 1.21. If you have an older version of !DrawPrint installed please update to the new version. It is expected that all upcoming versions of !DrawPrint will also work together with luafox.

2.5.3 Clipboard

Use the three Clipboard icons to cut, copy and paste data to and from the clipboard. To copy data to the clipboard make a selection first and press the Copy button. Use the Cut button instead to delete the content of the selected cells.

To copy the data to the clipboard but delete the selected cells use the Delete columns or Delete rows button.

Use the Paste button to insert the clipboard to the current selection. Note that the selected cells will be overwritten by the data from the clipboard. If the selection is smaller than the data held in the clipboard, not all data from the clipboard are written to the table. If the data in the clipboard are smaller than the selection, all other cells will be empty.

To insert the full content of the clipboard into a table use the Paste entry of the Table menu. This will insert the clipboard starting from the cell the mouse pointer was over when the menu was opened. This will overwrite existing cells and add new columns and rows as necessary.

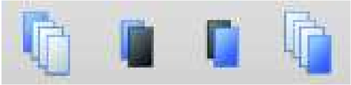
Remember that the Project Manager menu provides a way to transpose the clipboard. You can also delete the clipboards content there.

Alternatively you can use the keyboard: Use ctrl-x to cut, ctrl-c to copy and ctrl-v to paste data.

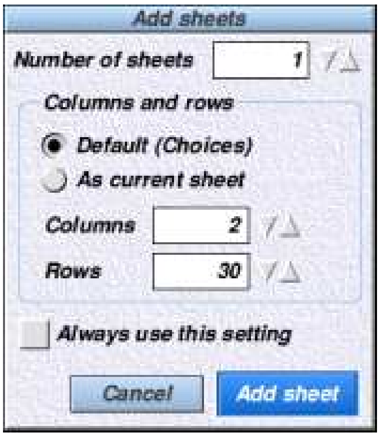
2.5.4 Refresh

This button will refresh the window content. It is possible to set the column values by using an expression. This expression can be stored in the table. Using the refresh button will write the content of columns again if an expression is stored for it. Since the expression can access other tables it can be used to synchronize data between tables. It is also possible to use an expression so that e.g. column 3 is the sum of column 1 and 2. If you change the values in one of the first two columns, the Refresh button will recalculate the third column.

2.5.5 Insert sheets



A Table object can contain more than one sheet. The group of four icons is used to add a new sheet, either at the beginning of the table, before the current sheet, after the current sheet or at the end of the table. By default a dialog box appears that lets you choose how many sheets you would like to insert and set the number of columns and rows.



Add sheets

Number of sheets 1

Columns and rows

● Default (Choices)

○ As current sheet

Columns 2

Rows 30

□ Always use this setting

Set the number of sheets, columns and rows that you would like to insert

Choosing default will insert the number of columns and rows as defined in the configuration. The option "As current sheet" will insert the number of columns and rows of the current sheet. In both cases you can change the values of the number fields. If you tick the option to always use this setting no dialog box will appear the next time you insert a sheet but it will remember the current setting and use that instead. This is valid until you start luafox the next time. To change it permanently please use the configuration.

If you want to open the dialog box again just hold down the Alt key while clicking on one of the insert sheet buttons.

Another way to insert more than one sheet at once is to use the Table menu.

As a special feature you can also drag a sheet or a table from the Project Manager here to add/append it to the current table.

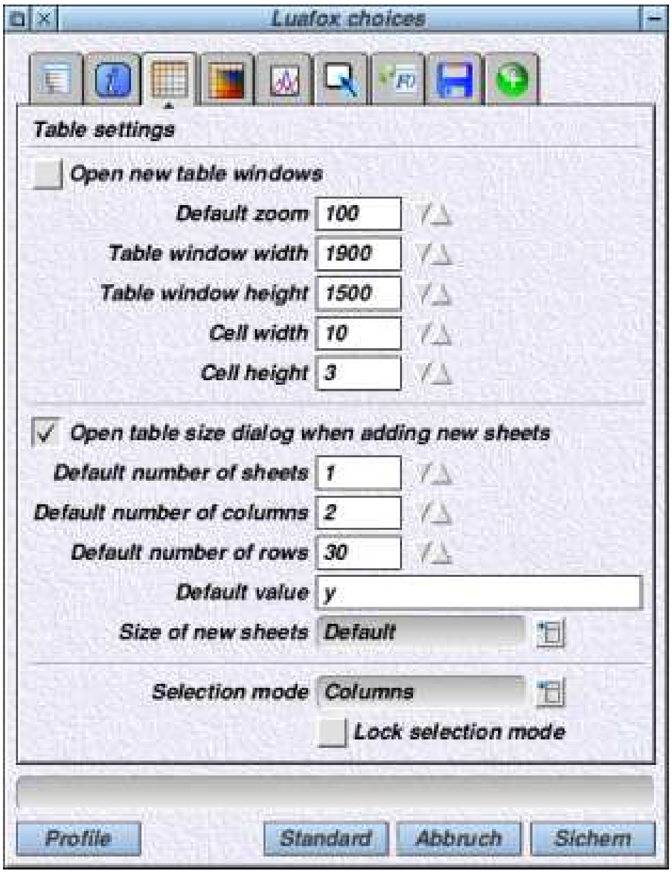


Table settings

☐ Open new table windows

Default zoom 100

Table window width 1900

Table window height 1500

Cell width 10

Cell height 3

☑ Open table size dialog when adding new sheets

Default number of sheets 1

Default number of columns 2

Default number of rows 30

Default value y

Size of new sheets Default

Selection mode Columns

☐ Lock selection mode

Set the default values for inserting new sheets

2.5.6 Copy sheet

This button will make a copy of the current sheet in the Pinboard of the Project Manager.

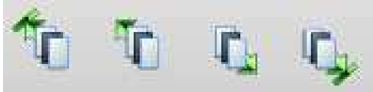
2.5.7 Delete sheet

The button will delete the current sheet or the whole table if it is the last sheet.

2.5.8 Split table

This button will split a Table object with n sheets into n individual tables with only one sheet each.

2.5.9 Move sheet



The next group of four icons will move the current sheet in the table to the beginning, up, down or to the end.

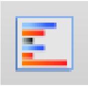
2.5.10 Flip sheet

The Flip buttons will flip the whole table horizontally or vertically.

2.5.11 Transpose sheet

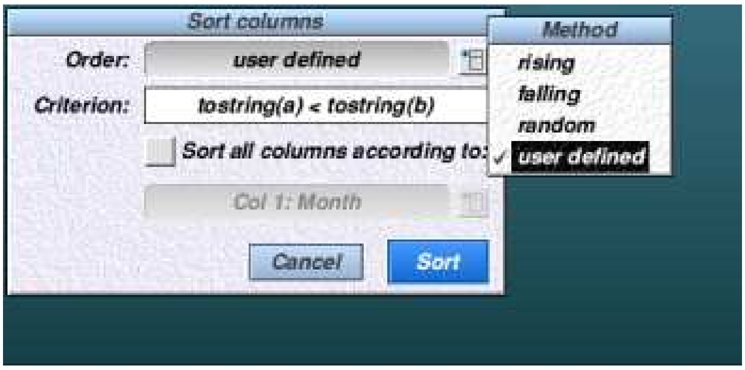
The Transpose button exchanges x and y or rather columns and rows. Note that the header values get lost if you apply this function and they do not appear again if you transpose the table again. Use the undo function if you accidently transposed the table to bring back the header values.

2.5.12 Sort values



Use the Sort function to sort the values of the current selection. If there is no selection, the whole table is sorted. The classical way of sorting in rising or falling order can be selected from the menu. There is also the possibility to "sort" with random order; this is the opposite of the classical sort function and will de-sort the values.

Another option is to use a user defined criterion for sorting. Use "a" and "b" for the two cell entries that need to be compared. An expression like "a < b" is equal to the sort rising option. Use "tostring(a) < tostring(b)" to sort alphabetically.



Sort columns

Order: user defined

Criterion: tostring(a) < tostring(b)

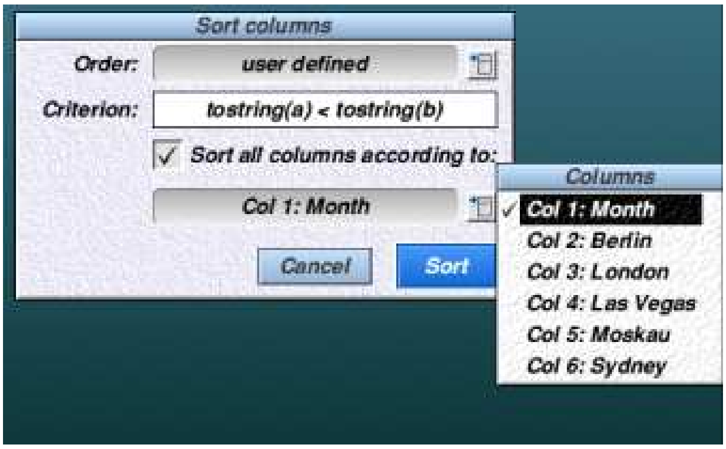
□ Sort all columns according to:

Col 1: Month

Choose a method to sort a number of columns, rows or a block of data

By default every column and row will be sorted on its own. But it is often necessary to sort a table by one column or row: e.g. a table containing the names of people in the first column and their age in the second column. It makes no sense to sort both columns by themselves because the link between names and ages will be lost. By ticking the "Sort all columns according to" you can choose a column from the menu. Only this column will be sorted, all other columns stay linked to this column.

This way it is easy to either sort the list either alphabetically or by the age of the people. If the table has an header line "Label" the labels will be used in the menu to make it easier to find the right column.



Order: user defined

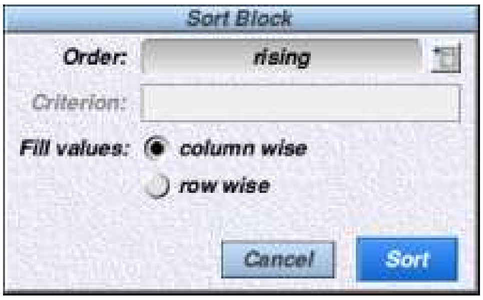
Criterion: tostring(a) < tostring(b)

☑ Sort all columns according to:

Col 1: Month

Sort all columns according to one

If the selection mode is set to "block", the sorting will take into account all values of the selection, ignoring columns and rows. The sorted values will then be written column or row wise, depending on user's choice.



Order: rising

Criterion:

Fill values: ● column wise ○ row wise

When sorting a block you can choose if you want to order the result column or row wise

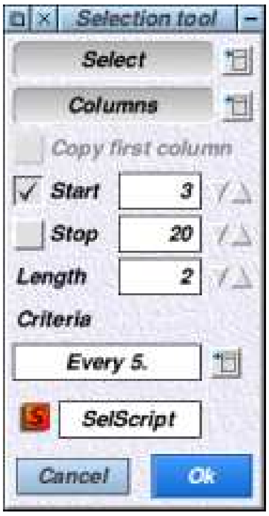
The sort function demonstrates the idea of the selection mode very nicely. Only the setting of the selection mode determines how the values will be sorted, not whether you actually selected columns, rows or a block of data. It is possible to select a number of columns, set the selection mode to rows and sort the data of the rows in the selection.

2.5.13 Apply a function

Use this button to apply a function quickly to the current selection or the whole sheet. To do that you can either choose an inbuilt function or define your own one. How to create your own functions will be explained in the chapter about functions.

2.5.14 Selection tool

The first icon in the second row calls the Selection Tool. It will allow you to make selections on rows and columns. Optionally you can add a start and end point of the selection and set a criterion for which columns/rows will be selected. Also, a length of the selection can be set, that defines how many columns or rows will be selected.



Select

Columns

□ Copy first column

☑ Start 3

□ Stop 20

Length 2

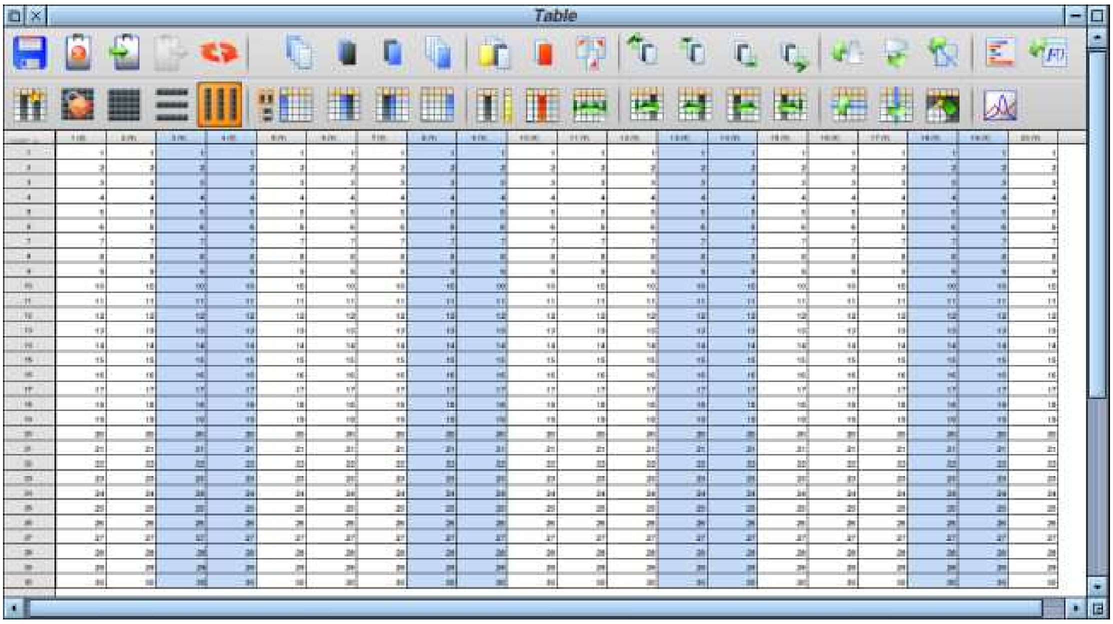
Criteria

Every 5.

SelScript

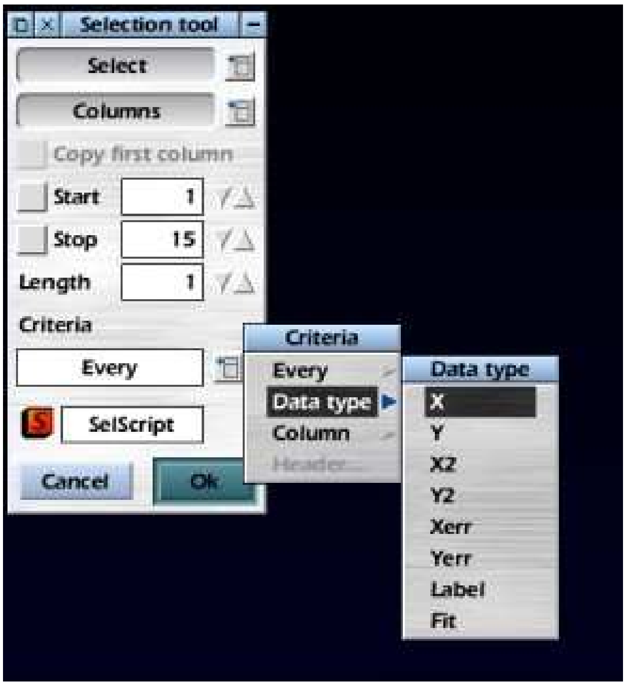
The selection tool helps you to select a number of columns and rows automatically

For example: If the table has twenty columns and you set a start of 3 and no end and you choose to select every 5th column and a length of 2, then the following columns will become selected: 3,4,8,9,13,14,18,19. The selection starts to count at the start value, selects it and due to the length of 2 it also selects column 4. The next selection is column 8, because every 5th column was to be selected, and so on.



The selection tool helps you to make selections

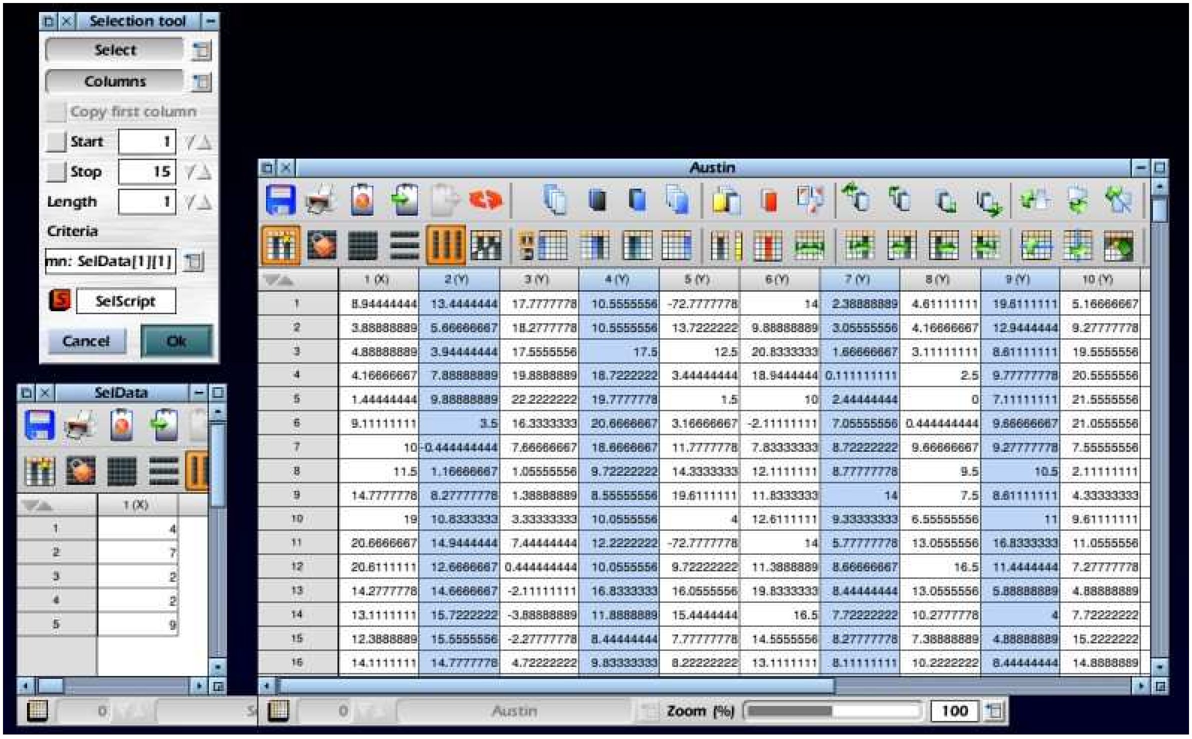
In luafox 1.2 there are now more options to define automatic selections.



Start 1
Stop 15
Length 1
Criteria: Every

The Selection Tool now allows you to select all X columns of the current sheet

Another new concept is to use the values in a data column for the selection of columns in any table.



Start 1
Stop 15
Length 1
Criteria
mn: SelData[1][1]

SelData

	1 (X)
1	4
2	7
3	2
4	2
5	9

Austin

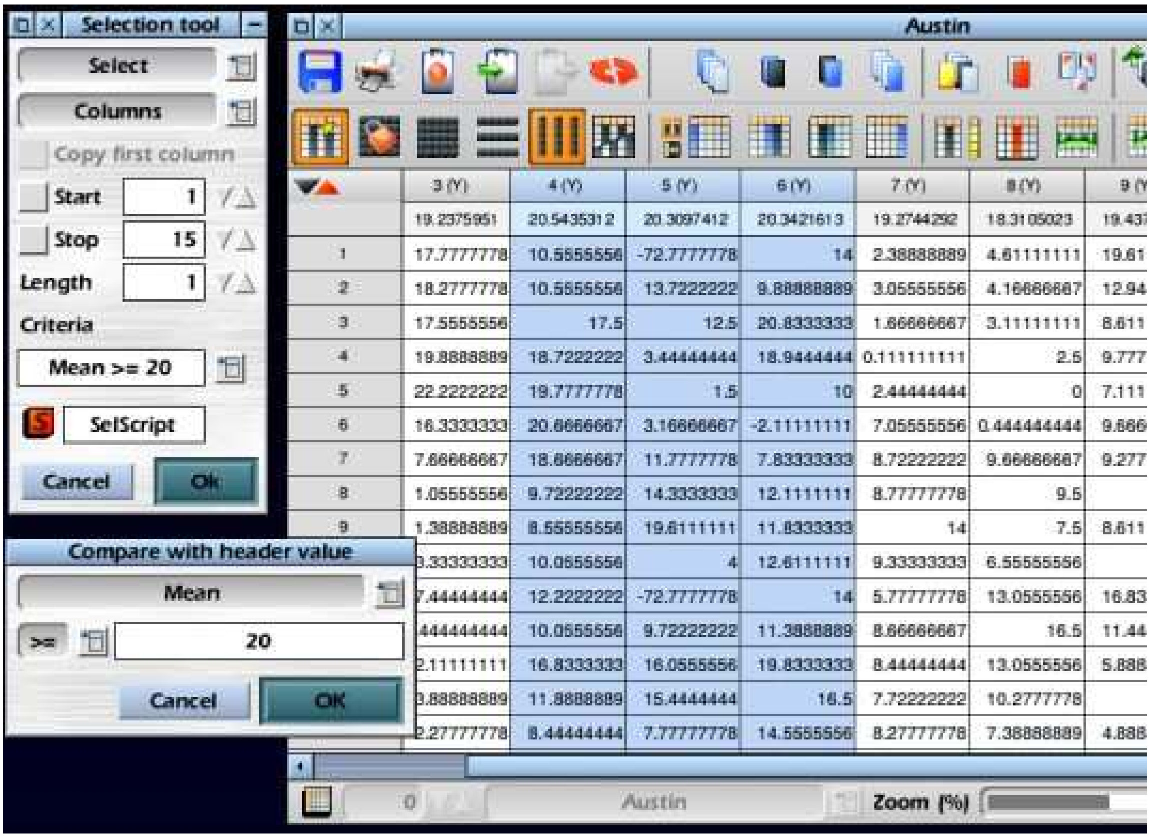
	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)	7 (Y)	8 (Y)	9 (Y)	10 (Y)
1	8.94444444	13.4444444	17.7777778	10.5555556	-72.7777778	14	2.38888889	4.61111111	19.6111111	5.16666667
2	3.88888889	5.66666667	18.2777778	10.5555556	13.7222222	9.88888889	3.05555556	4.16666667	12.9444444	9.27777778
3	4.88888889	3.94444444	17.5555556	17.5	12.5	20.8333333	1.66666667	3.11111111	8.61111111	19.5555556
4	4.16666667	7.88888889	19.8888889	18.7222222	3.44444444	18.9444444	0.111111111	2.5	9.77777778	20.5555556
5	1.44444444	9.88888889	22.2222222	19.7777778	1.5	10	2.44444444	0	7.11111111	21.5555556
6	9.11111111	3.5	16.3333333	20.6666667	3.16666667	-2.11111111	7.05555556	0.444444444	9.66666667	21.0555556
7	10	-0.444444444	7.66666667	18.6666667	11.7777778	7.83333333	8.72222222	9.66666667	9.27777778	7.55555556
8	11.5	1.16666667	1.05555556	9.72222222	14.3333333	12.1111111	8.77777778	9.5	10.5	2.11111111
9	14.7777778	8.27777778	1.38888889	8.55555556	19.6111111	11.8333333	14	7.5	8.61111111	4.33333333
10	19	10.8333333	3.33333333	10.0555556	4	12.6111111	9.33333333	6.55555556	11	9.61111111
11	20.6666667	14.9444444	7.44444444	12.2222222	-72.7777778	14	5.77777778	13.0555556	16.8333333	11.0555556
12	20.6111111	12.6666667	0.444444444	10.0555556	9.72222222	11.3888889	8.66666667	16.5	11.4444444	7.27777778
13	14.2777778	14.6666667	-2.11111111	16.8333333	16.0555556	19.8333333	8.44444444	13.0555556	5.88888889	4.88888889
14	13.1111111	15.7222222	-3.88888889	11.8888889	15.4444444	16.5	7.72222222	10.2777778	4	7.72222222
15	12.3888889	15.5555556	-2.27777778	8.44444444	7.77777778	14.5555556	8.27777778	7.38888889	4.88888889	15.2222222
16	14.1111111	14.7777778	4.72222222	9.83333333	8.22222222	13.1111111	8.11111111	10.2222222	8.44444444	14.8888889

Zoom (%) 100

Use the values in "SelData" to select columns in a table

The table "SelData" only contains 5 values: 4,7,2,2,9. In the SelTool window the criterion is set to `Column: SelData[1][1]`. This means that the columns 2,4,7 and 9 get selected in the "Austin" table. Note that the number 2 appears twice but that has no effect on the selection. Also note that fractional numbers are always rounded to a smaller number, so a value of 11.7 will select column 11. This criterion may seem a little bit strange at first but remember that you can do any calculations in a column so you can use this feature to implement criteria which are not build into luafox.

There is one more new criterion for selecting columns based on header values. If a table contains one or more header lines it is possible to select those columns of which its header value is equal to a certain value. The comparison is not limited to "equal", in the following example a header line showing the mean values of each column is added to the table. The criterion is set to select all columns with a mean equal to or above 20:



Start 1
Stop 15
Length 1
Criteria Mean >= 20
SelScript

Compare with header value: Mean >= 20

	3 (Y)	4 (Y)	5 (Y)	6 (Y)	7 (Y)	8 (Y)	9 (Y
	19.2375951	20.5435312	20.3097412	20.3421613	19.2744292	18.3105023	19.43
1	17.7777778	10.5555556	-72.7777778	14	2.38888889	4.61111111	19.61
2	18.2777778	10.5555556	13.7222222	9.88888889	3.05555556	4.16666667	12.94
3	17.5555556	17.5	12.5	20.8333333	1.66666667	3.11111111	8.611
4	19.8888889	18.7222222	3.44444444	18.9444444	0.111111111	2.5	9.777
5	22.2222222	19.7777778	1.5	10	2.44444444	0	7.111
6	16.3333333	20.6666667	3.16666667	-2.11111111	7.05555556	0.444444444	9.666
7	7.66666667	18.6666667	11.7777778	7.83333333	8.72222222	9.66666667	9.277
8	1.05555556	9.72222222	14.3333333	12.1111111	8.77777778	9.5	
9	1.38888889	8.55555556	19.6111111	11.8333333	14	7.5	8.611
	3.33333333	10.0555556	4	12.6111111	9.33333333	6.55555556	
	7.44444444	12.2222222	-72.7777778	14	5.77777778	13.0555556	16.83
	444444444	10.0555556	9.72222222	11.3888889	8.66666667	16.5	11.44
	2.11111111	16.8333333	16.0555556	19.8333333	8.44444444	13.0555556	5.888
	3.88888889	11.8888889	15.4444444	16.5	7.72222222	10.2777778	
	2.27777778	8.44444444	7.77777778	14.5555556	8.27777778	7.38888889	4.888

Select columns whose mean value is equal to or greater than 20

The selection tool not only allows you to make selections but also to combine an action with it. Instead of just selecting columns or rows, it is also possible to insert new ones, copy or move (separate) them to a new table, to mask or delete them.

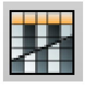
So with this tool you could for example automatically delete all data columns which standard deviation is above a certain value. Or you can extract them into a new table (see below) for further analys. So you can use it as some kind of data filter.

Some more words are necessary to describe the copy and separate options. If you choose to copy every second column then every second column of the current table will be copied into a new one. This option can be used to copy only parts of a table. The separate option will do the same but move the data, so that it disappears from the current table. If either copy or separate options are chosen there is an additional option to "Copy first column". Often data tables consist of x data in the first column and y data in all the following. This option allows you to copy the first column, which is probably the x column, to the new table, independent of the other criterion set.

The selection tool also offers to save the current settings as a script which can be saved to the Project Manager. If you need to perform a certain operation very often you can save it as script and just drag the script to a table to execute it.

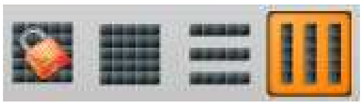
2.5.15 Invert Selection

(introduced in luafox 1.2)



This button just inverts the current selection. It can be used to select the whole table quickly if there is no selection. It is also possible to use it together with the selection tool to invert its criteria.

2.5.16 Selection mode



An example of using the selection mode has been given in the sections about selecting and sorting values. The selection mode determines how the selected data are handled. There are three ways to make a selection: You can select columns, rows or blocks of cells. Usually the selection mode is adjusted automatically so that functions applied to a selection work in the expected way. But it can be a powerful tool to change the way a function is applied to the data.

A good example is the sum function. If a number of columns are selected and also the selection mode is set to "columns" and the sum function is applied, it will sum up the values of the columns. If the selection mode is set to rows, instead the values of the rows are summed up, but only the values inside the selected columns. If the selection mode is set to block, all the values in the selection are summed up and the result is only one number, the sum of all the values.

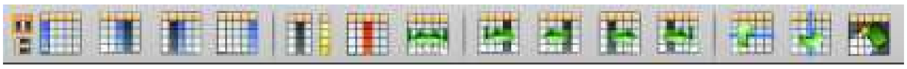
To avoid the automatic switching between the selection modes you can set the lock and choose the selection mode you prefer. It will not change automatically anymore unless you unlock it again.

2.5.17 Column and row buttons

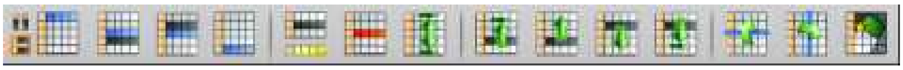
If you select a number of columns then the column buttons are shown in the second row of the toolbar; if you select rows the row buttons appear.

In the following sections the buttons are described in detail. Only the column buttons are shown but the buttons work in a similar way also for rows. It is possible to switch between column and row buttons manually, which enables you to perform some extra operations, and this is especially useful if you select a block of data. This is described in more detail at the end of this chapter.

Column buttons



Row buttons



Depending on the selection either column or row buttons are shown

2.5.18 Adding columns and rows

The next buttons to insert columns are similar to the sheet buttons. Here you can insert columns (or rows, see below), at the beginning, before the currently selected columns, after the current selection and at the end. Note that if more than one column is selected and you choose to insert a new column left or right of the selection than a new column will be inserted left or right of every selected column. Use the table menu to insert more than one column.

2.5.19 Copy columns and rows

Selecting a column and pressing the copy column button will insert a copy of the column after the selected one. The same is true for rows. If you select a block of data instead, a new table containing the selected data values will appear in the Pinboard window.

2.5.20 Delete columns and rows

This button will delete all selected columns or rows. When a block is selected there is a difference, whether you delete columns or rows. When columns are deleted the values in the columns on the left of the selection will move into the gap. If you use the Delete rows button then the values from below will move upwards.

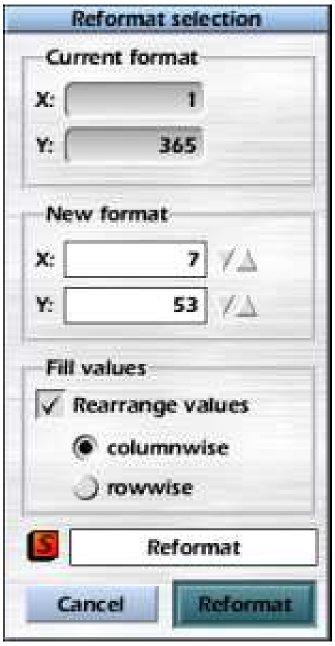
2.5.21 Reformat

If you want to change the number of columns and rows of the current sheet you can use the reformat tool. Pressing the Reformat button will open a new window, where the current number of columns and rows is shown. You can change these values in the new format section. Please note that entering lower values than those of the current sheet will lead to a loss of data. If you reduce the number of rows e.g. from 10 to 8 then the content of the last two rows gets lost.

luafox also offers a way to reformat the data of a selection or whole table. This allows you to change the format but keep the data by rearranging the values. If there is a selection it will show the size of the selection as current format, otherwise the size of the whole table will be shown. In the middle section of the window the new format can be entered by altering the number of columns and rows. If the rearrange values option is ticked changing the number of columns will in most cases influence the number of rows and vice versa so that all values will fit in the new table.

In the bottom section you can choose how the values are written in the new table. You can fill in the values columnwise or rowwise. The values are read from the source table in the same way. If you want the values e.g. to be read rowwise but written columnwise then transpose the table before. The new and reformatted table will be appended to the current one.

As an example let's assume that you have the average temperature for every day of a year. This is one column with 356 rows, one for every day. Now you want to analyze whether the average temperature on Mondays is different from that on Fridays. To do that just reformat the table to 7 columns with 53 rows (fill rowwise) and each column now contains the data for one weekday. The first column will be the weekday that was the 1st January of that year. Then you can move the columns to bring Monday to the front and calculate the mean value for all columns to see whether there is any dependence.



Reformat selection

Current format

X: 1

Y: 365

New format

X: 7

Y: 53

Fill values

☑ Rearrange values

● columnwise

○ rowwise

Reformat

Rearrange values

It is also possible to save a script of the current settings made in the dialog box (introduced in luafox 1.40). This allows you to apply the same settings to other tables. Just change the settings in the dialog box and drag the script to the Project Manager. From there you can drag it to any other table to reformat the data in the same way. This can be very usefull if you often need to import data files from the same source which arranges the data in the wrong format. Using the script you need to define how to reformat the data only once and then apply it as often as necessary.

2.5.22 Moving columns and rows

The next group of four icons will move the selected columns to the beginning, one column to the left or right or to the end. Rows will be moved to the top, one row upwards or downwards or to the bottom. Also a selected block of data can be shifted in the same way. Note that you can toggle between the column and row button set manually to be able to move the block in all directions.

2.5.23 Flip column and row values

If a number of columns is selected the Flip buttons will only flip the values of the selected columns or rows. The Flip buttons also works if more than one column is selected, e.g. if columns 3,4,5 are selected the values will be flipped to 5,4,3. If there is a gap in the selecting of columns, every block of columns will be treated independently from each other, e.g. when you select the following columns: 3,4,5 and 7,8,9, after pressing the Flip vertically the values will be flipped to: 5,4,3 and 9,8,7.

This works analogously for a number of selected rows.

If a block of data is selected only the selected values will be flipped horizontally or vertically.

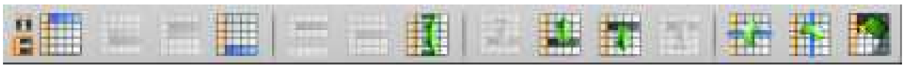
2.5.24 Clean table

With this button you can quickly delete all empty columns or rows of the table to clean it up. When using the left mouse button, only empty columns or rows are deleted, depending on the button shown. Use the right button to clean both, empty columns and rows.

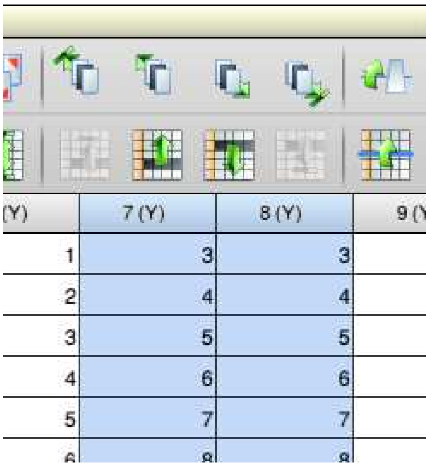
2.5.25 Manual switching between column and row buttons

There are two small icons placed above each other. These can be used to switch the icons in the second row. Even when a number of columns are selected the row buttons can be displayed. This enables you to perform some extra operations.

If a number of columns are selected and you switch to display row buttons then the icon to move rows up and down will rotate the data inside the selected columns. That means, a value on the top will be moved to the bottom, the second value in the column will become the first one and so on, if the Move row upwards button is used.



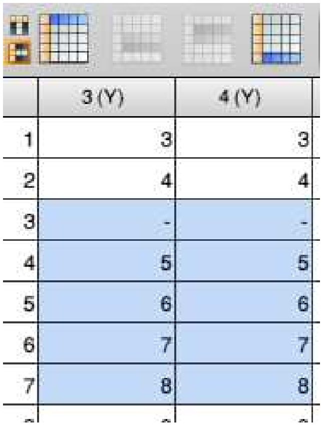
If you select a number of columns and switch to show row buttons you can perform some additional operations



(Y)	7 (Y)	8 (Y)	9 (
1	3	3	
2	4	4	
3	5	5	
4	6	6	
5	7	7	
6	8	8	

Use the buttons for moving rows to rotate the values of selected columns

Also the buttons to insert rows are enabled. You can use them to insert new rows at the beginning or end of the selected rows. A similar behavior can be found when rows are selected and you use the column buttons.



	3 (Y)	4 (Y)
1	3	3
2	4	4
3	-	-
4	5	5
5	6	6
6	7	7
7	8	8

Insert cells by selecting a block and using the insert row buttons

If a block of data is selected you can also switch between the row and column icons. They all work in a similar way. Note that the move buttons will always move the selected block. To rotate the values of a block use the menu.

2.5.26 Line plot and bar chart

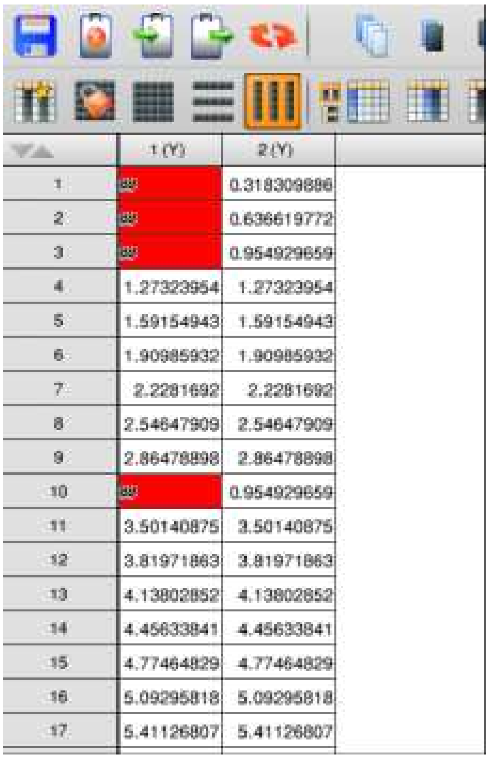
Select at least one X-column and one Y-column to plot the values in a line plot or bar chart. The graph is shown in a new window. The appearance of graphs can be changed in many ways; they are described in chapter 4.

2.6 Edit columns

If you double click the head of the column you can change some of its settings. You can change the width of column, the number format, an entry in the header or you can enter an expression for calculating the column values. Choose the action from the four tabs and note that only the currently shown tab is taken into account when the OK button is pressed. Click the OK button with Adjust to keep the window open.

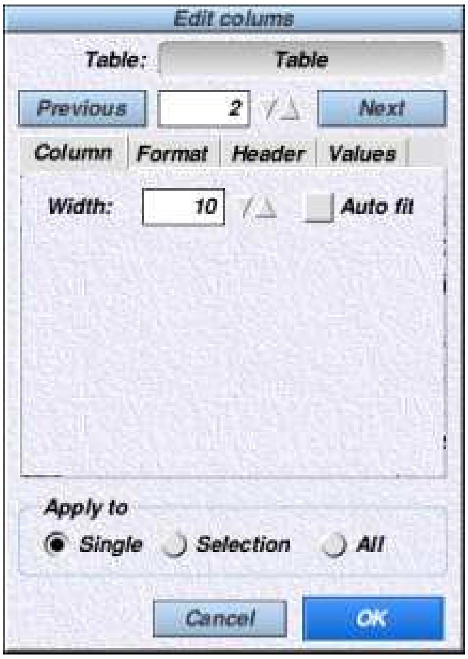
For all settings you can choose whether they are applied to a single column, all selected columns or all columns. The single column will be the column you double clicked to open the Edit columns window. Use the Previous and Next button to go to another column or change the number directly.

2.6.1 Column tab



	1 (Y)	2 (Y)
1	[illegible]	0.318309886
2	[illegible]	0.636619772
3	[illegible]	0.954929659
4	1.27323954	1.27323954
5	1.59154943	1.59154943
6	1.90985932	1.90985932
7	2.2281692	2.2281692
8	2.54647909	2.54647909
9	2.86478898	2.86478898
10	[illegible]	0.954929659
11	3.50140875	3.50140875
12	3.81971863	3.81971863
13	4.13802852	4.13802852
14	4.45633841	4.45633841
15	4.77464829	4.77464829
16	5.09295818	5.09295818
17	5.41126807	5.41126807

If the width of a cell is too small to show the number the cell is marked with a red background. Increase the width to show all values



Edit colums

Table: Table

Previous | 2 | Next

Column | Format | Header | Values

Width: 10 □ Auto fit

Apply to

● Single ○ Selection ○ All

Edit the width of the column

In the column tab you can enter the width of the column. Tick the Auto-fit option to adjust the column width to the data values automatically.

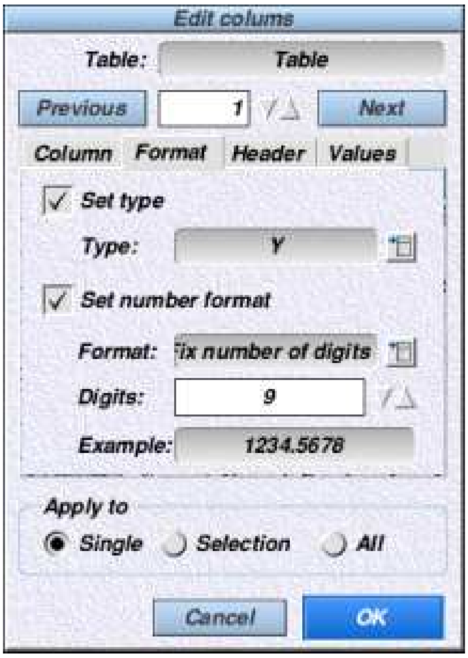
2.6.2 Format tab

Tick the Set type option to set the type for the column. By default the first column is set as X column and all following columns are set as Y columns. The type setting of the columns may influence the standard behavior of some program functions. E.g. when plotting the X columns, are used as X values and the Y columns as data points to be plotted. Type Y2 can be used to plot a curve on the second Y axis. This is usefull if you want to display two curves in the same graph but the values of both data sets are completely different. Use X2 it the values of the X axis differ to much between to sets of curves. Another type is "Fit" that is automatically given to columns that contain results of fitting functions. When displaying graphs, columns with a type of "Fit" are shown in a different style. So it is e.g. easy to plot data points as dots and the fitted function as a line. The types "Xerr" and "Yerr" can be set to keep a better overview of the data. In future versions of luafox they may also be used for plotting error bars in graphs automatically.

Tick the "Set number format" option to change the number format shown in that column. Fix number of digits will always show a fixed number of significant digits. This is best seen in an example. If you choose to show six digits, the number 123 will be displayed as 123.000, the number 1234 will be displayed as 1234,00. So there are always six digits shown, the number of decimal places shown depends on the number. In the Example filed it is shown how the display of a number (1234.5678) with the current setting looks like.

Fix number of decimal places will always show the same number of decimal places.

Scientific notation will always show the number with an exponent.



Edit colums

Table: Table

1

☑ Set type

Type: Y

☑ Set number format

Format: Fix number of digits

Digits: 9

Example: 1234.5678

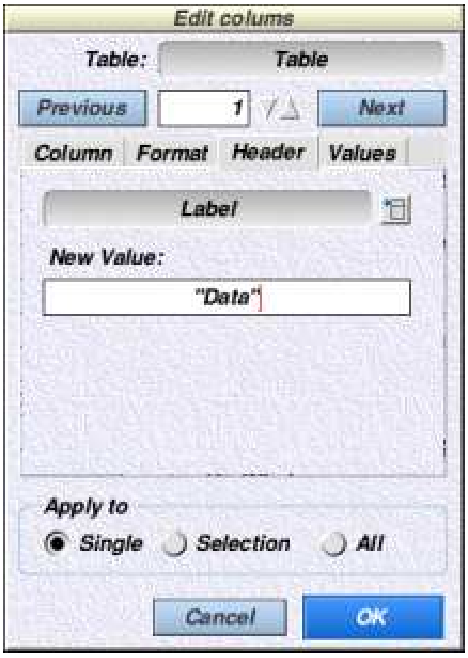
Apply to

● Single ○ Selection ○ All

Change the data type of the column and set the number format

2.6.3 Header tab

Columns can have one or more header lines giving additional information about the data (see next section). Using the header tab you can change the value of the header entry on single columns, which is otherwise not possible.



New Value: "Data"

Change the header value of individual columns

2.6.4 Values

Enter an expression here to calculate the values of a column. If you enter a number here, all fields in the column will be filled with this number. Enter `x` to fill in the number of the current column, `y` for the current row.

To access other data cells you can use a number of functions. There are two kinds of functions, those that refer to the current selection in the sheet and those that don't.

The `col(n)` command accesses data in the nth selected column. If columns 3 and 4 are selected then `col(1)` will point to the data of column number 3, because this is the first selected column. So using `col(n)` is a relative data link. If you want to access a specific column, no matter which columns are selected, use `tcol(n);` this will access the nth column of the table. So in the exampe above `col(1)` is equal to `tcol(3)`.

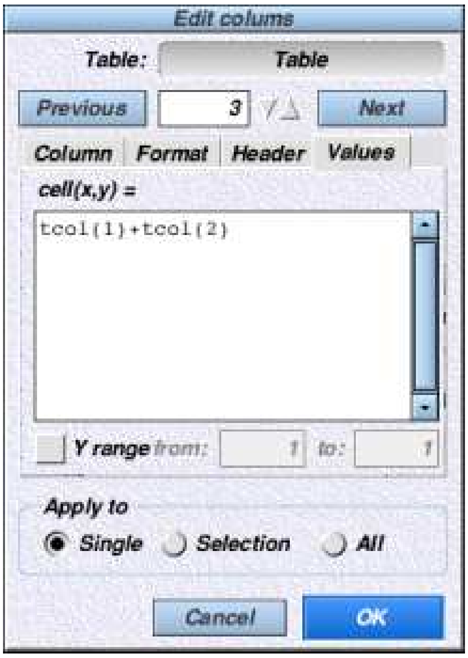
Instead of numbers you can also use `x` and `y` here. E.g. if you enter `tcol(x-1)` in the values field, the current column copies the values of the column before. Of course you could also use `tcol(3)` if you modify the values of column 4, which does the same.

The advantage is that you can just copy and paste `tcol(x-1)` to another column and it will do the same. Please note that the column values can also be applied to a single column, a selection or all columns, depending on the radio button at the bottom of the dialog box. In most cases you may only want to apply the value expression to a single column, so it is worth keeping this in mind. Using relative expressions and applying them to more than one column is a powerful tool but you need to keep in mind two things:

First: It will lead to problems if you try to use an expression like `tcol(x-1)` on the first column because there is no column zero.

Second: If you have selected all columns except the first one and you want e.g. to add the columns together by entering an expression like `tcol(x-1)+tcol(x)` you may think that it will add column 1 and 2, put the result in column 2 and then add column 2 and 3, put the result in column 3 and so on. This is not the case. The order in which the columns are calculated is random. So it might happen that column 2 and 3 are summed and the result is put into column 3 before column 1 and 2 are summed. This leads to unpredictable results and such a use of commands is not intended.

Instead of the `col()` command you can also use the `row()` and `trow()` to access data rows and also `cell(x,y)` and `tcell(x,y)` to access individual cells.



Previous 3 Next

cell(x,y) =

```
tcol(1)+tcol(2)
```

□ Y range from: 1 to: 1

Apply to: ● Single ○ Selection ○ All

Fill column 3 with the sum of column 1 and 2

Other tables can be accessed using `Tablename[sheet][column][row]`, e.g. if there is a table called data and you want to fill your column in another table with the values of the data table from the third column of its second sheet, use: `data[2][3][y]`.

There is another way to change the values or columns or rows quickly, the quick function, which can be accessed from the function menu which is described later in the chapter about functions. The main difference is that the expression is saved within the column and can be changed or reapplied later. It will also be executed when you press the Refresh button and recalculate the column values.

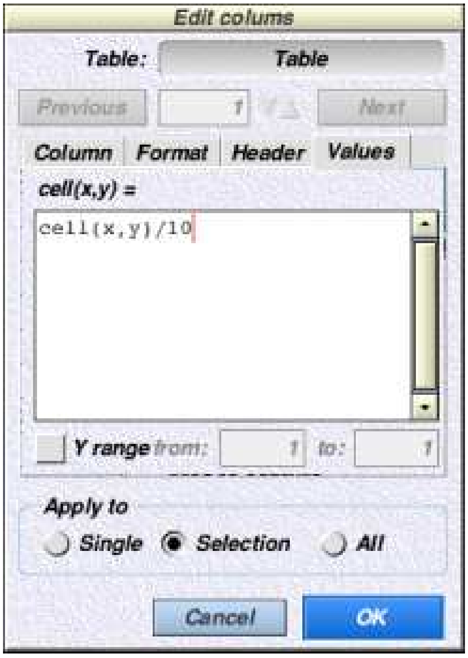


Table: Table

1

cell(x,y) =

```
cell(x,y)/10
```

□ Y range from: 1 to: 1

Apply to

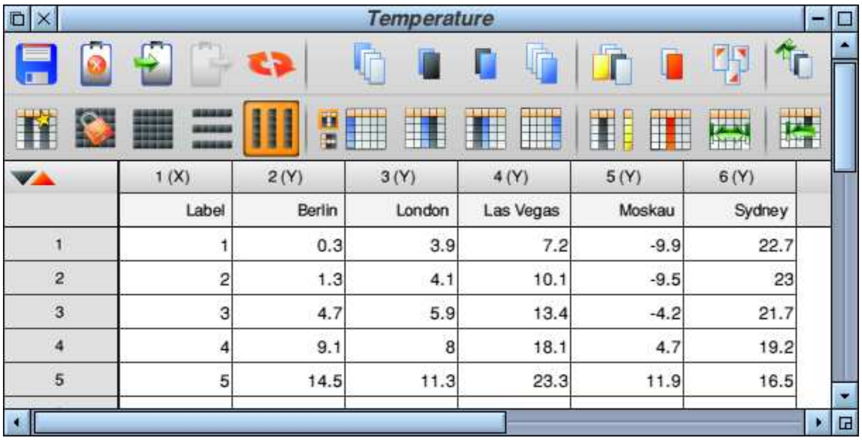
○ Single ● Selection ○ All

Edit the values of a column

As an example try the following: Open a new table with 10 columns and fill it with value `x` so that the first column contains number 1, the second number 2 and so on. Now define the values for column 10 as `col(1)-col(2)`. This will always fill column 10 with the difference between the first and second selected column. If you now select column 2 and 5 and press the refresh button then column 10 will contain "-3", if you select column 3 and 8 and refresh it will be filled with "-5" and so on.

2.7 Header

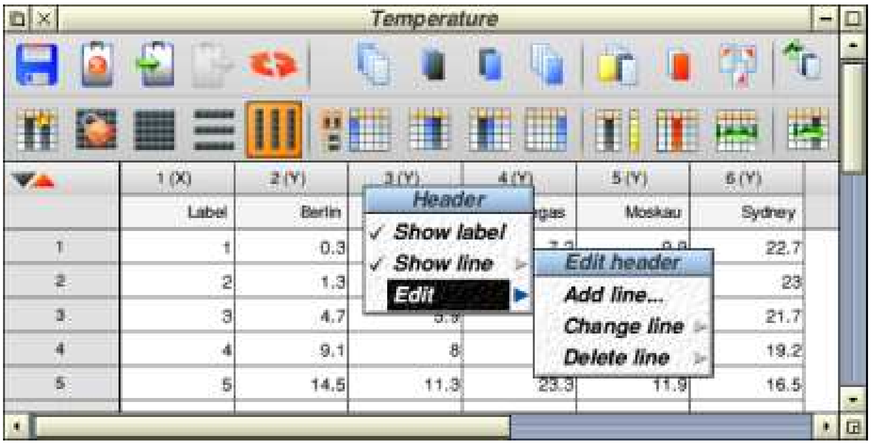
A header line may appear if you import data that contains additional information, see the section about data import. In the header you can give columns a name or store further information.



	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
	Label	Berlin	London	Las Vegas	Moskau	Sydney
1	1	0.3	3.9	7.2	-9.9	22.7
2	2	1.3	4.1	10.1	-9.5	23
3	3	4.7	5.9	13.4	-4.2	21.7
4	4	9.1	8	18.1	4.7	19.2
5	5	14.5	11.3	23.3	11.9	16.5

The header shows additional information about the data columns

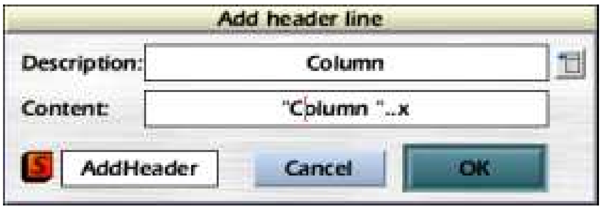
You can add additional header lines, change or delete them at any time. If you click the menu over the column top you have access to the header lines.



	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
	Label	Berlin		gas	Moskau	Sydney
1	1	0.3				22.7
2	2	1.3				23
3	3	4.7				21.7
4	4	9.1	8			19.2
5	5	14.5	11.3	23.3	11.9	16.5

Use the menu to add more header lines, change or delete them

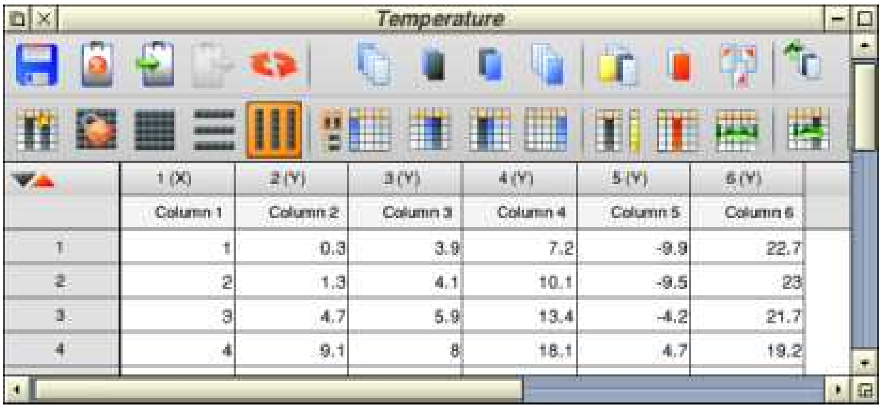
If you choose to add a header line, you can give it a name and specify an expression. The name must be unique; otherwise the line will not appear. The name "Label" has a special meaning, it is used to label the curves in a graph, so use this name for a short description of the column values.



Description: Column

Content: "Column "..x

Adding a new header line



	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
1	1	0.3	3.9	7.2	-9.9	22.7
2	2	1.3	4.1	10.1	-9.5	23
3	3	4.7	5.9	13.4	-4.2	21.7
4	4	9.1	8	18.1	4.7	19.2

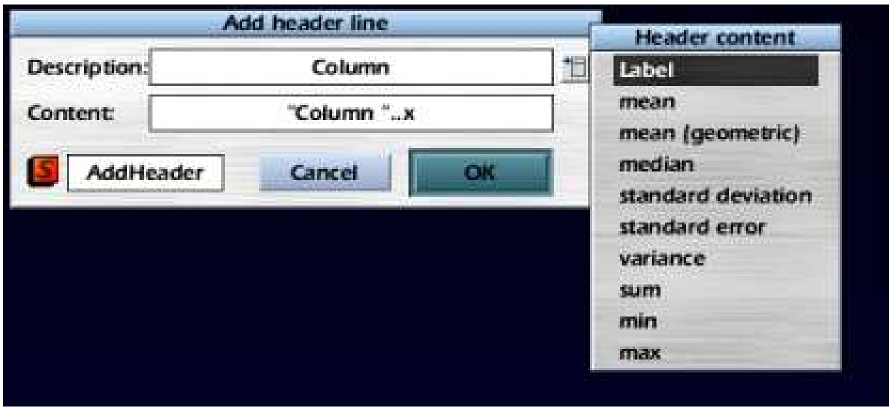
Example header line showing the column number

The expression can simply be a piece of text. Use quotes to enter a text. Again the variable x contains the column number. Try to use an expression like `"Column "..x` including the quotes to add a header line that tells you what column it is. Use `string.char(64+x)` to add a header line containing the ASCII characters from 65 upwards. If there are more than 26 columns you will notice that no upper case letters are shown but other characters. You can repeat the alphabet by using the mod operator which is implemented as %-sign in lua. Try changing the header line expression to `string.char(x%26+64)`. The expression x%26 will always output a value between 0 and 25. This almost works in the example, just that instead of the Z you find the @-Character. Change the expression again to: `string.char((x-1)%26+65)` to get the desired result.

There is a special expression in Luafox to make labeling with repeating values easier. Create a new table called "days" which has at least one column with seven rows. Now enter the weekdays in the first column (do not forget to use quotes when you enter text). In the field for the header expression you can now use the command `list("days",x)` to fill in the weekdays. In the list command you need to specify the name of the table and the element you want to read. It is just a short form for the expression `days[1][1][(x-1)%7+1]`. It will access the first column of the first sheet in the given table. When the element value is larger than the number of rows it will jump back to the first row and starts counting again.

Individual header fields can be changed by using the Column edit window (as described above).

There are also a few predefined header lines which can be accessed from the label menu.



Description: Column

Content: "Column "..x

Use the menu to choose from predefined header lines

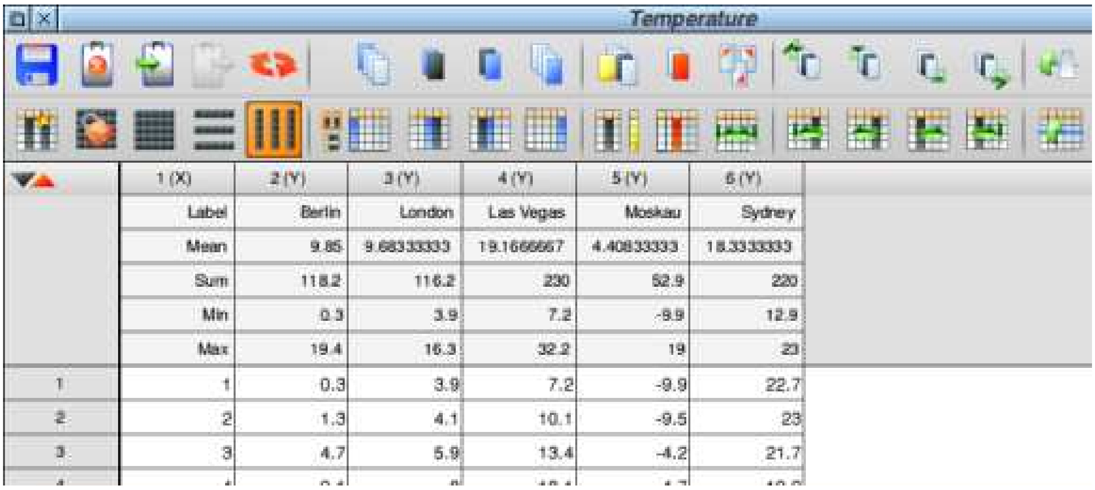
These allow you to show e.g. the mean of a column in the column head, or the minimum and maximum value of a given column.

It is also possibe to save the header as a script (introduced in luafox 1.40) and apply the same settings to other tables. It works in the same way as the SelTool and Reformat scripts.

Once you add one or more header line you can hide them quickly by using the icon in the top left corner of the table. Press this icon again to show the header lines.

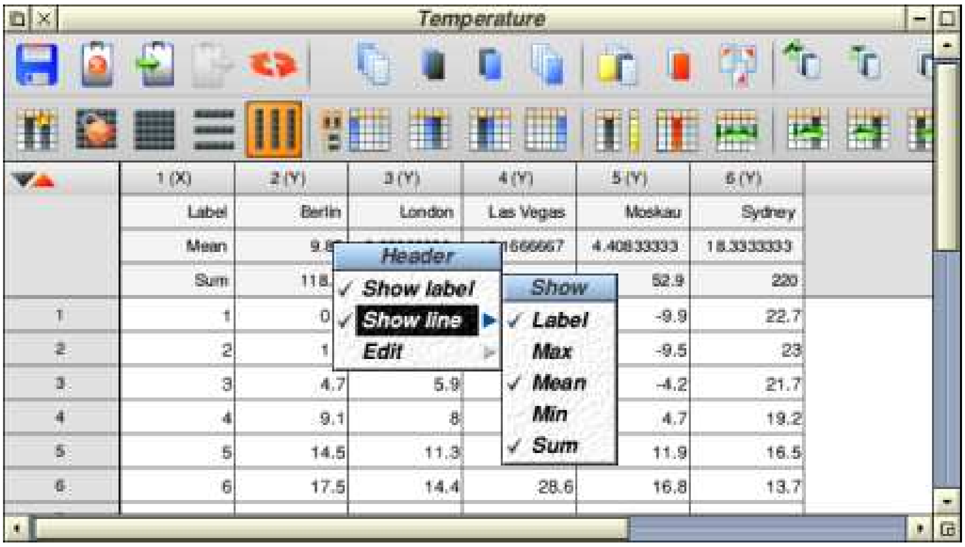
Using the menu you can also choose which header lines should be shown and which should be hidden.

The first entry in the header menu allows you to show the header labels. They are displayed in the header fields of the first column and allow you to see what the header lines contain. Often the first column is used for X data and it makes no sense to show the header data in the first column.



	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
	Label	Berlin	London	Las Vegas	Moskau	Sydney
	Mean	9.85	9.68333333	19.1666667	4.40833333	18.3333333
	Sum	118.2	116.2	230	52.9	220
	Min	0.3	3.9	7.2	-9.9	12.9
	Max	19.4	16.3	32.2	19	23
1	1	0.3	3.9	7.2	-9.9	22.7
2	2	1.3	4.1	10.1	-9.5	23
3	3	4.7	5.9	13.4	-4.2	21.7

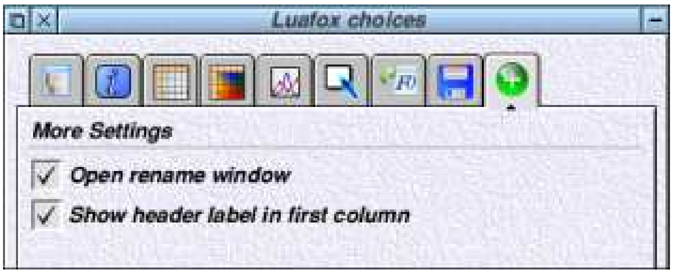
You can display many header lines at once and quickly hide them using the icon with the two triangles



	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
	Label	Berlin	London	Las Vegas	Moskau	Sydney
	Mean	9.8		1666667	4.40833333	18.3333333
	Sum	118.			52.9	220
1	1	0			-9.9	22.7
2	2	1			-9.5	23
3	3	4.7	5.9		-4.2	21.7
4	4	9.1	8		4.7	19.2
5	5	14.5	11.3		11.9	16.5
6	6	17.5	14.4	28.6	16.8	13.7

Use the header menu to show or hide header lines

The default value can be set in the configuration:



More Settings

☑ Open rename window

☑ Show header label in first column

Configuration of additional settings

2.8 Search & Replace (introduced in luafox 1.50)

Open the Search & Replace dialog by pressing F4 or use the utilities submenu of the table menu.

2.8.1 Search

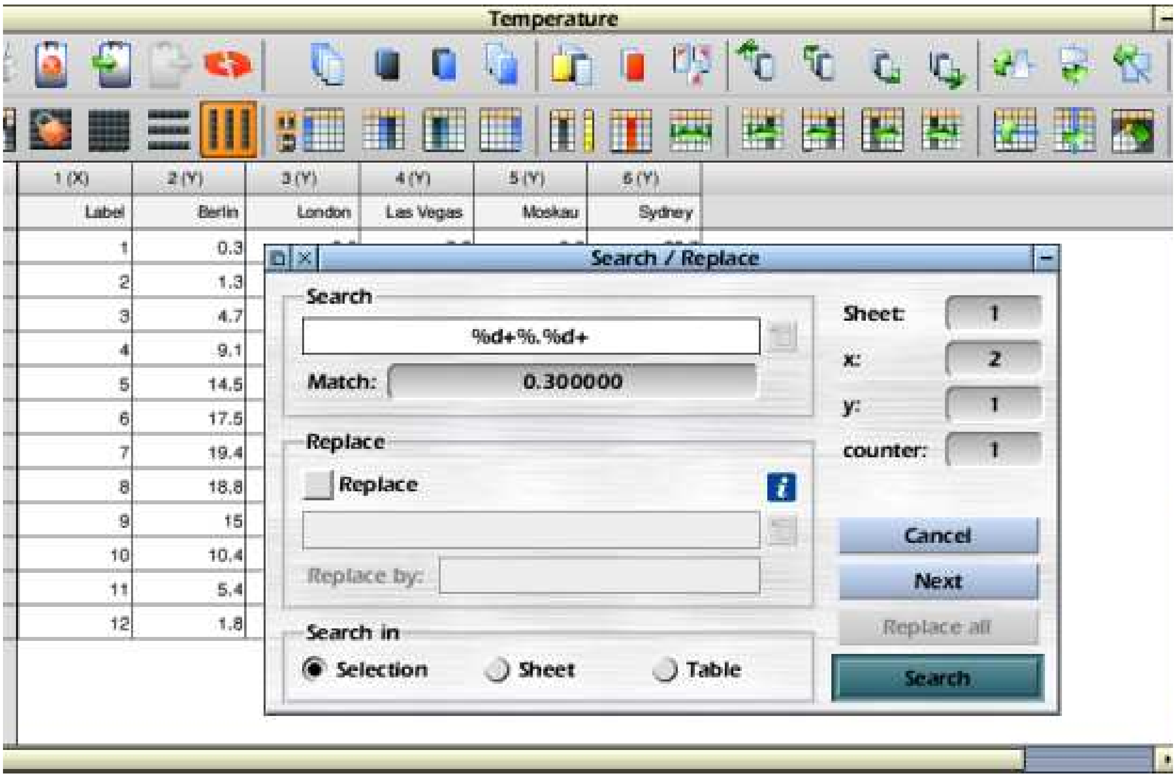
In the seach section of the dialog window you can enter a lua search expression or simply a number you are looking for. The most commonly used wildcards are:

Pattern	Meaning
.	all characters
%a	letters
%d	digits
%l	lower case letters
%u	upper case letters
%p	punctuation characters
%w	alphanumerical characters
%x	hexadecimal characters
+	1 or more repetitions
*	0 or more repetitions
?	0 or 1 occurances
^	match at the beginning
$	match at the end
%	escape character, e.g. %. to match a dot

f you enter an expression in the search field and choose the location to look for the expression. This can be the current selection only (the whole sheet if there is no selection), the current sheet or the whole table. Pressing the search button will always start the search from the beginning. That means if you have opened sheet 3 and you are searching the whole table the first match may be found on sheet 1. If a match is found some information about the location is shown in the right hand corner of the dialog box: The sheet number, the column (x) and row (y) as well as the counter which shows how many matches have been found up to this cell. If you press the next button the search is continued from the current location.

The search string as shown above: "%d+%.%d+" will find one or more digits followed by a dot followed by one or more digits. It is important to keep in mind that the search will look at the cell content and will not take into account the current format settings. So if you configure the table not to show any decimal places the search function will still find them.

The expression "%d" will match a single digit. To match a sequence of digits "%d+" is used. The next part "%." will match a dot. We have to use the "%" escape character here because the "." has a special meaning (see table above) and will match all characters. Just using the dot ("%d+.%d+) would also match all numbers like "13.45" because the dot is also a character but it would also match "13:45" and "13x45" and so on. Also important to know is that the expression "%d%.%d+" (only one digit before the dot) will also match with "23.82" because there is still one digit in front of the dot. If you want to search for numbers < 10 only, you need to change the expression to "^%d%.%d+", the "^" means that no other character is allowed in front of the one digit.



1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
Label	Berlin	London	Las Vegas	Moskau	Sydney
1	0.3				
2	1.3				
3	4.7				
4	9.1				
5	14.5				
6	17.5				
7	19.4				
8	18.8				
9	15				
10	10.4				
11	5.4				
12	1.8				

Search: %d+%.%d+

Match: 0.300000

Sheet: 1

x: 2

y: 1

counter: 1

Replace

□ Replace

Replace by:

Search in

● Selection ○ Sheet ○ Table

Search & Replace dialog box

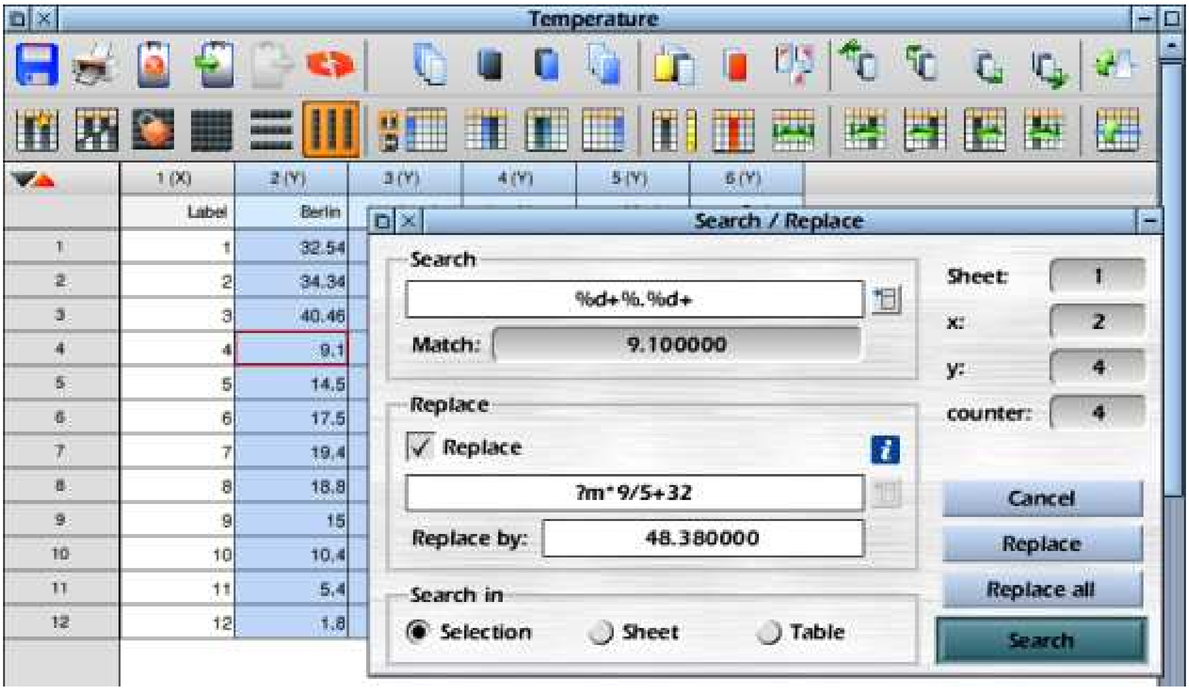
2.8.2 Replace

Searched expressions can also be replaced manually or by using a replace expression. In the simples case you can just enter a fix number in the replace field. But in most cases you will probably use a more advanced expression in the replacement field.

If you want to change the temperaturtes from the example data table "Temperatures" into degree Fahrenheit you can do it with the search & replace dialog in the following way:

The expression "?m" will automatically insert the found result into the replace field. So here the cell matching the search expression contains the number 9.1. The search result can now be used in the replacement expression by using "?m" (m like match). You can then execute some calculations with the search result like we have done here to convert the temperature from Celsius to Fahrenheit. There are a few more special expressions: "?x" is the number of the column of the found cell, "?y" is the row number and "?z" the number of the sheet. Additionally "?c" is the counter which is increased by one for every cell found that matches the search expression. A click on the blue info button shows the available expression in case you forgot them.

What happens if you have entered a replace expression and hit the search button is that the selection, sheet or table is searched for the search expression. If a cell is found the replacement expression is evaluated and the result written to the field "Replace by:". In this field you can see the result of the search and replace operation but it is not yet applied to the table. So no values have been changed, yet. This allows you to change the replace expression until the result matches the expectations. The replacement filed is also writeable, which allows you to make manual changes to the result as well. Only if you hit the "Replace" button the content of the cell is replaced and the next matching cell is searched. Pressing the "Replace all" button will replace all further cells matching the search expression.



	1 (X)	2 (Y)
	Label	Berlin
1	1	32.54
2	2	34.34
3	3	40.46
4	4	9.1
5	5	14.5
6	6	17.5
7	7	19.4
8	8	18.8
9	9	15
10	10	10.4
11	11	5.4
12	12	1.8

Search

%d+%.%d+

Match: 9.100000

Replace

☑ Replace

?m*9/5+32

Replace by: 48.380000

Search in

● Selection ○ Sheet ○ Table

Sheet: 1

x: 2

y: 4

counter: 4

Entries to convert from Celsius into Fahrenheit

Some more examples will show you how you can use the Search & Replace dialog for different purposes. If we take the Temperatures table again, you may want to add a "°C" to every number. You can do this by the following replace expression:

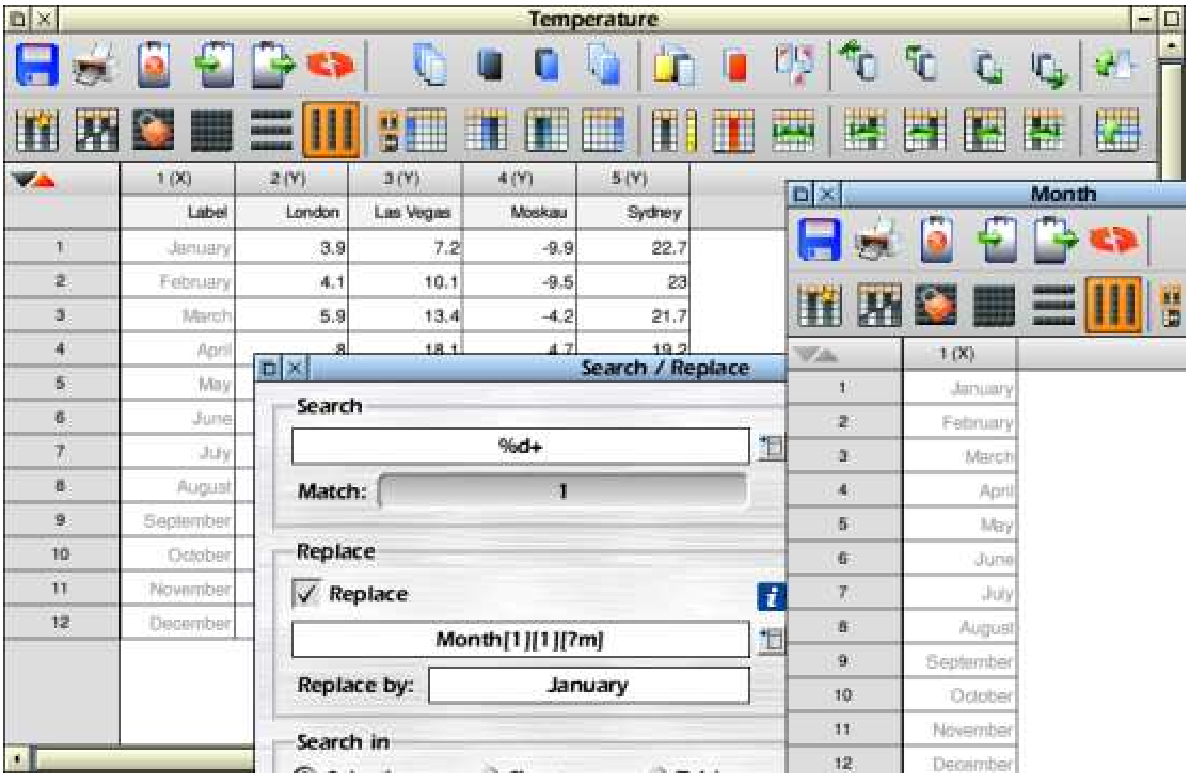
```
?m:tostring().."°C"
```

Because the search result "?m" is a number we have to convert it into a string first, before we can concatenate another string. If you try the expression you will notice that there are a lot of decimal places and you get a result like "15.60000°C". To limit the number of decimals, a string format can be defined which is the standard lua string format and is identical to the standard C format of the printf command. Here "%.2f" means that only 2 decimal places are used:

```
?m:tostring("%.2f").."°C"
```

As a result you should now get "15.60°C". Use the replace all button to convert the whole table.

You can also access tables from the replace field. In the example shown in the screenshot an expression was used to replace the number in the first column by the month. This also works correctly if the values in the first column are not in order.



Temperature

	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)
	Label	London	Las Vegas	Moskau	Sydney
1	January	3.9	7.2	-9.9	22.7
2	February	4.1	10.1	-9.5	23
3	March	5.9	13.4	-4.2	21.7
4	April	8	18.1	4.7	19.2
5	May				
6	June				
7	July				
8	August				
9	September				
10	October				
11	November				
12	December				

Month

	1 (X)
1	January
2	February
3	March
4	April
5	May
6	June
7	July
8	August
9	September
10	October
11	November
12	December

Search / Replace

Search

%d+

Match: 1

Replace

☑ Replace

Month[1][1][?m]

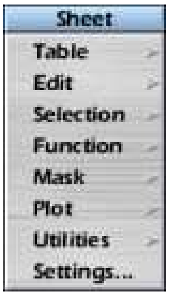
Replace by: January

Search in

Access data from other tables from within the search & replace dialog

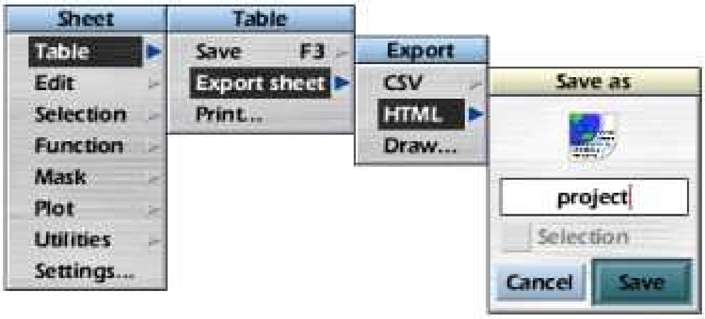
2.9 Table menu

The menu of the table window offers the same options as the toolbox buttons with only very few exceptions. Therefore the submenus will be explained here only partially since the functionality has been explained above.



Main menu of the table window

2.9.1 Sub menu: Table



Sub menu: Table

The Table sub menu lets you save and export the table or a selection in various formats. You can also print a table.

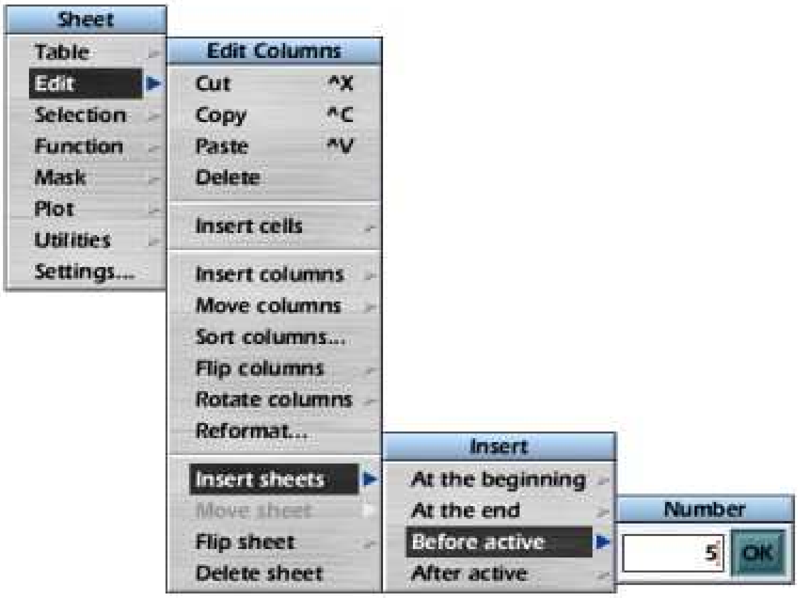
2.9.2 Sub menu: Edit

The upper part of the Edit sub menu allows you to cut, copy, paste and delete the selected data.

The next section allows you to insert cells at the beginning. Here you already see the difference to the toolbox buttons because many cells can be inserted at once. Just specify the number of cells you want to insert in the writeable field. This is shown in the screenshot for the case of inserting sheets.

The Edit sub menu changes depending on the current selection. In this example columns have been selected and so it offers many functions related to columns such as inserting new ones or sort the values of a column.

Rotate columns means that you permutate the values in a column. If you choose to rotate upwards then the value of the second cell is moved to the first, the thrid to the second and so on. The content of the first cell is then filled in the last cell at the bottom. Here is one difference to the toolbar: You can also rotate to the left or right.

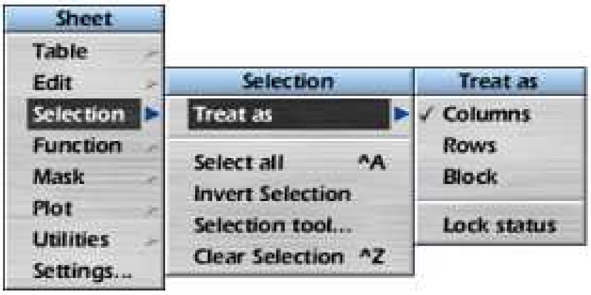


Sub menu: Edit

So, for example if you rotate to the right then the values of the first selected column will move to the second selected column and so on until the content of the last column will appear in the first one. So if you select only two columns this is a quick way to exchanging two columns. Please note that this only works when all selected cells form a block. So you can not select column 1 and 5 and try to rotate them. You need to take columns 4 and 5 for example. But it is possible to use more than one block. If you select column 1,2,4,5 and rotate the columns to right or left (this makes no difference in this case) then the values will be rearranged like this: 2,1,3,5,4. So columns 1 and 2 have changed its place as well as columns 4 and 5.

The last section deals with sheets and lets you insert, flip and delete them. Also here it is possible to insert more than one sheet at a time.

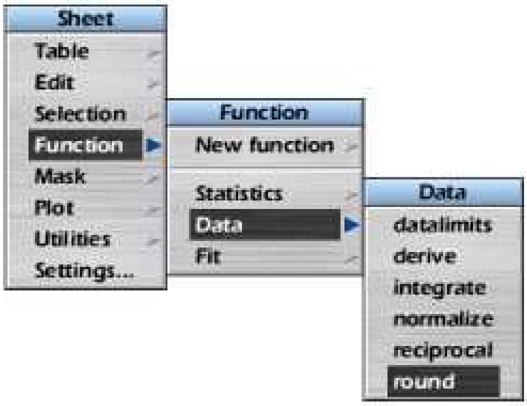
2.9.3 Sub menu: Selection



Sub menu: Selection

The Selection sub menu lets you apply and clear a selection, invert it or define it using the Selection Tool. Here you can also set the selection mode which defines how a selection is treated when functions are applied. The way a selection is treated is important to understand and has been explained above. If you should have missed that section it is recommended to read it since it might produce confusing results if you are not familar with this idea.

2.9.4 Sub menu: Function

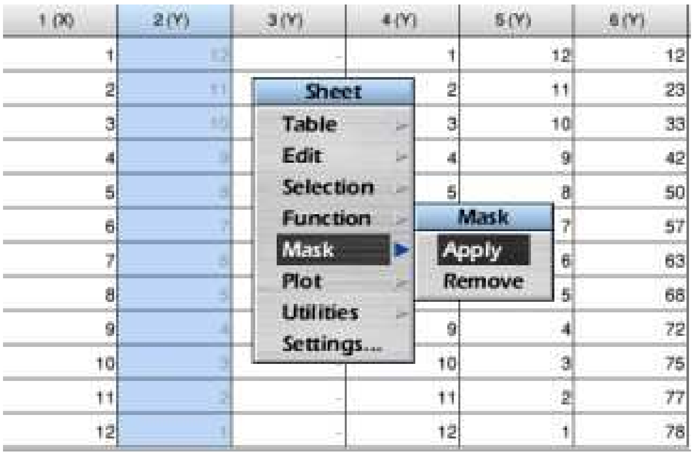


Sub menu: Function

With this sub menu you can quickly apply a predefined function to the current selection or the whole table. It is also possible to define your own function and apply it. Again this menu item is identical to the function button on the toolbar, see next chapter for a detailed description.

2.9.5 Sub menu: Mask

(introduced in luafox 1.2)



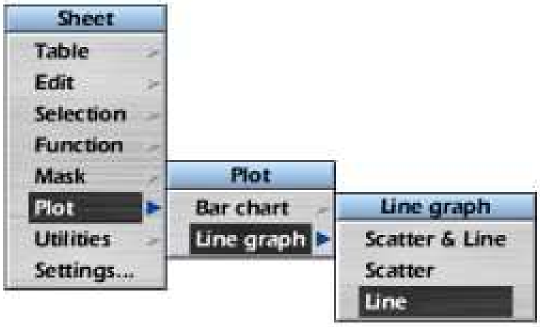
1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)
1	12	-	1	12	12
2	11		2	11	23
3	10		3	10	33
4	9		4	9	42
5	8		5	8	50
6	7			7	57
7	6			6	63
8	5			5	68
9	4		9	4	72
10	3		10	3	75
11	2	-	11	2	77
12	1	-	12	1	78

Sub menu: Mask

The mask function is only available from the table menu or using the Selection Tool. It will mask out data values which are then not used for calculations and not shown in plots. In the table they are greyed out.

When a mask is applied the number value is changed into a string value and handled as text. So if you have imported a table and some numbers are greyed out they have been interpreted as text and not numbers. Just use Mask -> Remove to change them into numbers.

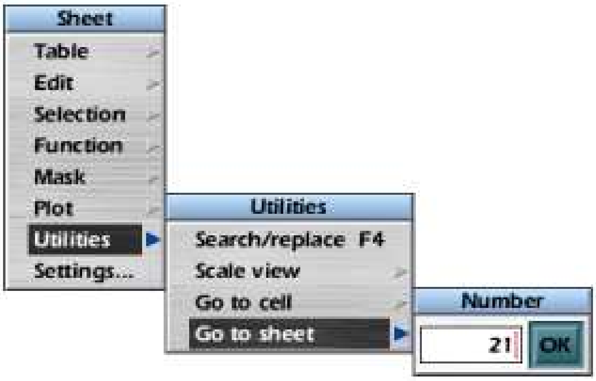
2.9.6 Sub menu: Plot



Sub menu: Plot

The plot sub menu lets you plot the current selection as Line graph or Bar chart. It lets you choose the type of graph you want to create, e.g. whether you want to plot a line, scatter or scatter & line graph. Also this entry is identical to the toolbar buttons.

2.9.7 Sub menu: Utilities



Sub menu: Utilities

From the utilities submenu you can quickly open the search & replace dialog box (introduced in luafox 1.50). You can also change the scale of the table display (this can also be set in the extra toolbar at the bottom of each window). It also allows you to go directly to a certain sheet or cell.

2.9.8 Settings...

This menu entry will open the Edit columns dialog box which lets you change the column width, the display format and data type etc. It is the same dialog box that opens when you double click on the coulmn number and has been explained in detail above.

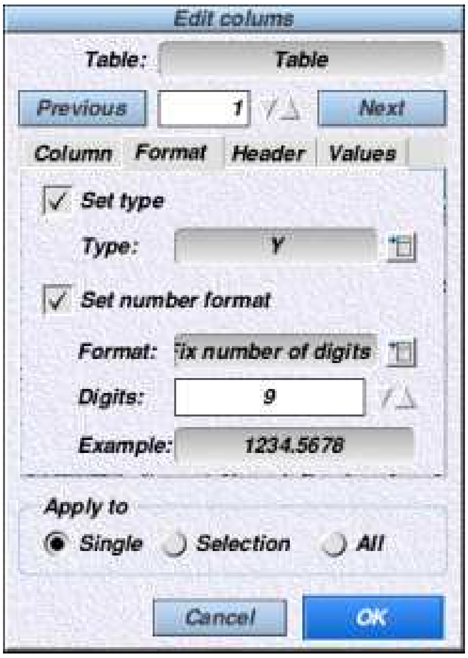


Table: Table

1

☑ Set type

Type: Y

☑ Set number format

Format: Fix number of digits

Digits: 9

Example: 1234.5678

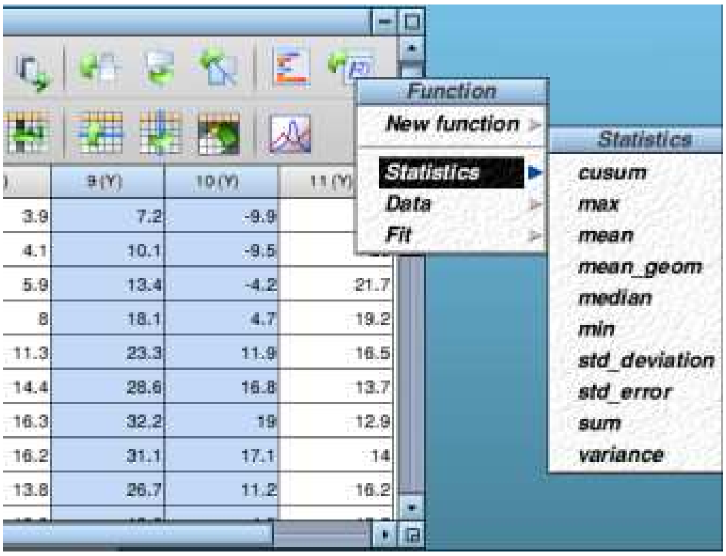
Apply to

● Single ○ Selection ○ All

Change the data type of the column and set the number format

3 Functions

luafox offers many function that can be applied to a selection of data to process them. The individual function will be described in the next sections. But there are some points to note about using functions in luafox.

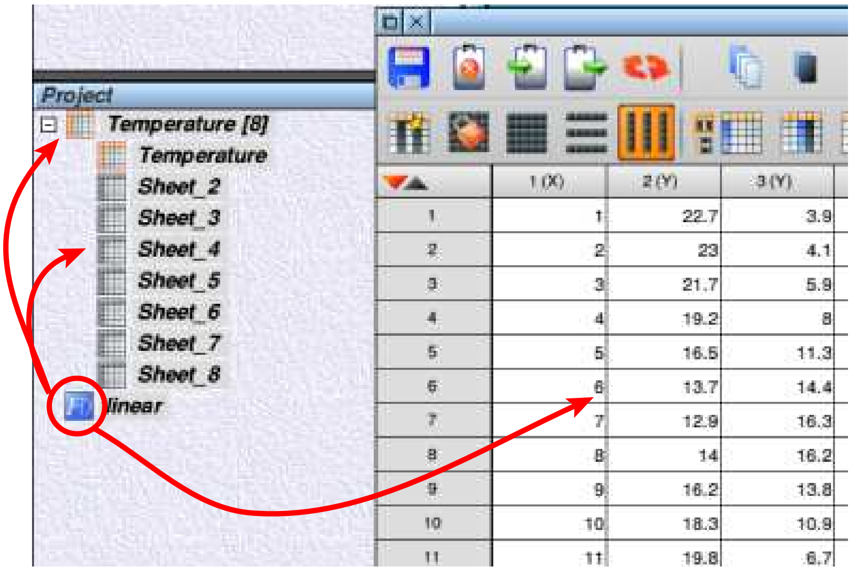


	9 (Y)	10 (Y)	11 (Y)
3.9	7.2	-9.9	
4.1	10.1	-9.5	
5.9	13.4	-4.2	21.7
8	18.1	4.7	19.2
11.3	23.3	11.9	16.5
14.4	28.6	16.8	13.7
16.3	32.2	19	12.9
16.2	31.1	17.1	14
13.8	26.7	11.2	16.2

Choose a function from the menu to apply it to the data

3.1 Applying functions

There are several ways to apply functions to a table in luafox. As already mentioned in the section about drag & drop it is possible to drag a function to the table node or one of its sheet nodes or directly to an open table window.



	1 (X)	2 (Y)	3 (Y)
1	1	22.7	3.9
2	2	23	4.1
3	3	21.7	5.9
4	4	19.2	8
5	5	16.5	11.3
6	6	13.7	14.4
7	7	12.9	16.3
8	8	14	16.2
9	9	16.2	13.8
10	10	18.3	10.9
11	11	19.8	6.7

Drag a function to a table or sheet node or an open table window to apply it

If you drag the function to an open table window it will be applied either to the whole sheet or, in case there is one, only to the current selection. Dragging a function to a sheet node will apply it to this sheet and dragging it to a table node will bring up a dialog window where you can choose to which sheets the function will be applied if you did not configure it otherwise. There you also have an option to apply it to all sheets.

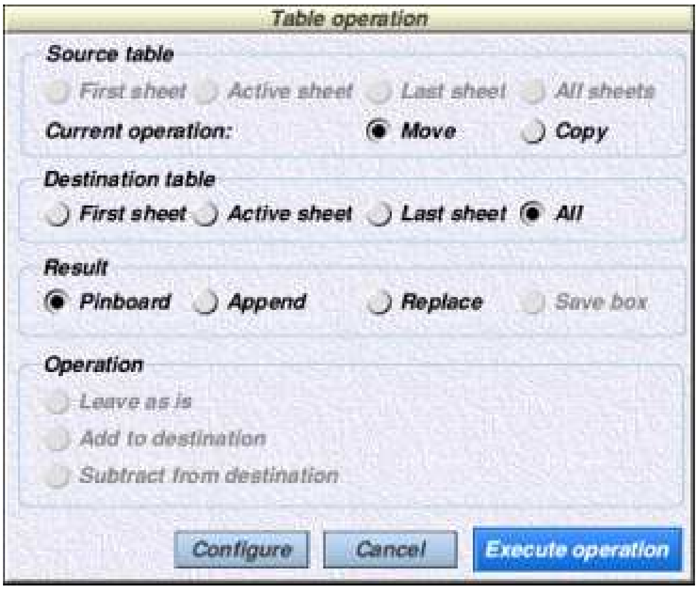


Table operation

Source table

○ First sheet ○ Active sheet ○ Last sheet ○ All sheets

Current operation: ● Move ○ Copy

Destination table

○ First sheet ○ Active sheet ○ Last sheet ● All

Result

● Pinboard ○ Append ○ Replace ○ Save box

Operation

○ Leave as is

○ Add to destination

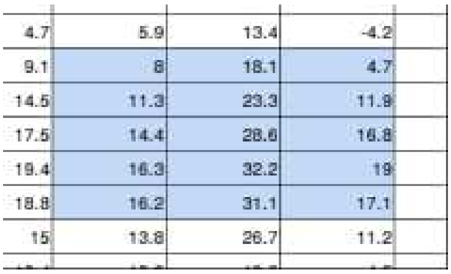
○ Subtract from destination

Apply a function to all sheets of a table

In a table window there is a special button in the top right corner of the toolbox to apply functions. Clicking on it will show a menu with all functions currently available in luafox.

Functions are applied to a selection of data. If there is no selection the function will be applied to the whole table, so there is no need to select the whole table before applying a function.

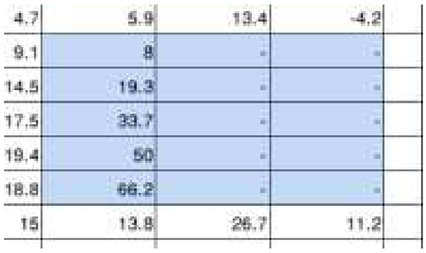
When applying a function the setting of the selection mode becomes very important. This has been described in the sections about selections and sorting. If you did not read this section please do so before continue reading here.



4.7	5.9	13.4	-4.2
9.1	8	18.1	4.7
14.5	11.3	23.3	11.9
17.5	14.4	28.6	16.8
19.4	16.3	32.2	19
18.8	16.2	31.1	17.1
15	13.8	26.7	11.2

Block selection of data values

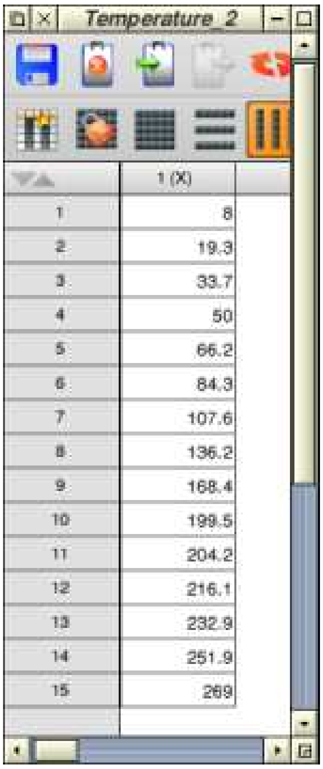
Especially when the selection mode is set to "block" it is important to note all the selected data will be handled at once. E.g. if the selection mode is set to "block" and you calculate the sum of the data the result will only be one number. Another example is the cumulated sum of the data. Applying this with the selection mode set to "block" will result in only one column or row of data containing the cumulated sum of all the selected values. Especially when you choose to overwrite the selection with the result (see below) then it might be irritating to see the result:



4.7	5.9	13.4	-4.2
9.1	8	-	-
14.5	19.3	-	-
17.5	33.7	-	-
19.4	50	-	-
18.8	66.2	-	-
15	13.8	26.7	11.2

Selection mode set to "block" and result replaces selection

If you choose to overwrite the selection, only the previously selected area is changed and hence the result of the calculation is one column with several rows and only part of the result becomes visible in the table. To avoid this there are two possibilities depending on what your intentions are. If you want to calculate the cumulated sum of the block then it is better to append the result as a new sheet or create a new table (see next section on how to do this):

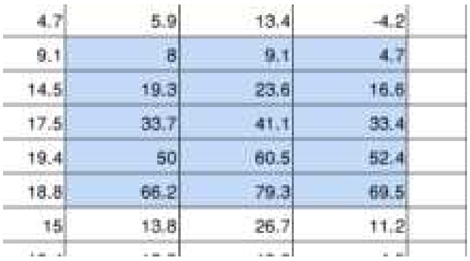


	1 (X)
1	8
2	19.3
3	33.7
4	50
5	66.2
6	84.3
7	107.6
8	136.2
9	168.4
10	199.5
11	204.2
12	216.1
13	232.9
14	251.9
15	269

Save the result as new table

If you want to calculate the cusum inside of the selected block but start new for every row then select the block of data but set the data mode to "columns" and the result will look as shown in the screenshot below.

These possibilities may sound confusing at the beginning but they allow you to apply a function in many different ways. As a rule of thumb: if you select a number of columns or a number of rows and you also set the selection mode accordingly you should get the expected result (if the selection mode is not locked this should happen automatically). But if you select a block of data it might be necessary to switch the selection mode to cols or rows.

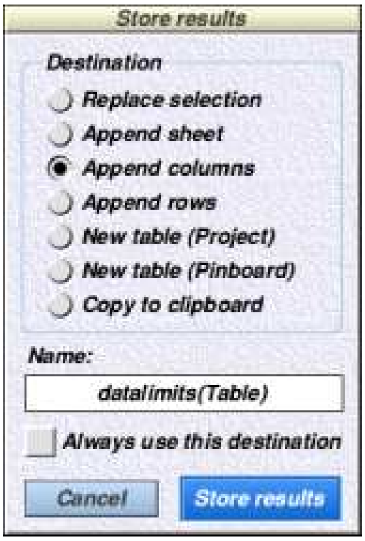


4.7	5.9	13.4	-4.2
9.1	8	9.1	4.7
14.5	19.3	23.6	16.6
17.5	33.7	41.1	33.4
19.4	50	60.5	52.4
18.8	66.2	79.3	69.5
15	13.8	26.7	11.2

Select a block of data and set the selection mode to "columns" to get this result

3.2 Store results

If a function is applied to a data selection the question is where to save the result. The default setting of luafox is to ask you every time you apply a function.



Store results

Destination

○ Replace selection
○ Append sheet
● Append columns
○ Append rows
○ New table (Project)
○ New table (Pinboard)
○ Copy to clipboard

Name: datalimits(Table)

□ Always use this destination

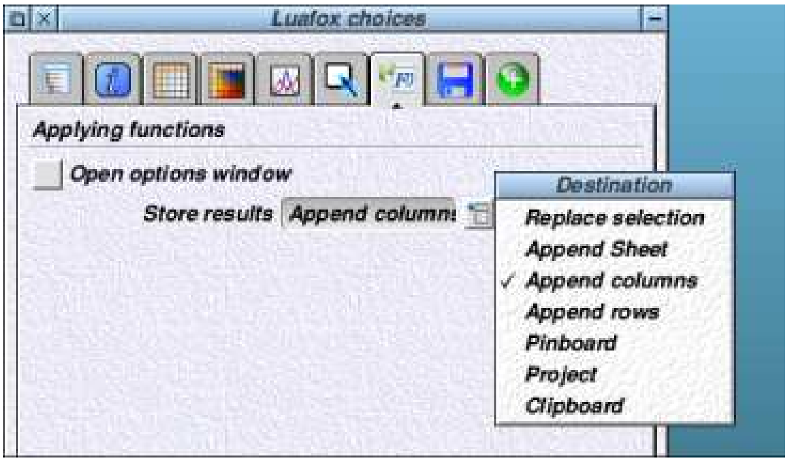
You can choose between lots of places to save the result

You can store the results at different places:

- The first option you have is to replace the current selection. This will overwrite the initial data with the result and the initial data gets lost.
- It is also possible to append a sheet which will contain the results
- You can also append columns or rows to the current sheet
- Another option is to create a new table window containing the results and open it either in the project or pinboard window
- The last option is to store the result in the clipboard. This way you can decide later what to do with the data but keep in mind that the clipboard will be overwritten once you execute another function. This is especially critical if you apply more than one function at a time

The dialog box also allows you to specify a name when you create a new table.

If you tick the option to use this destination always the dialog box will not appear the next time you apply a function and will always store it at the destination previously set until you restart luafox. For a permanent setting use the configuration:



Applying functions

□ Open options window

Store results Append column:

Configure whether you want to open the dialog box to set the destination everytime you apply a function and the default destination

You can set your favorite destination and choose not to open the dialog box to work faster. Remember that you can always force the dialog box to open by pressing the Alt key while choosing the function from the menu. This, again, allows you to define a default behavior while keeping all the options if a special case occurs.

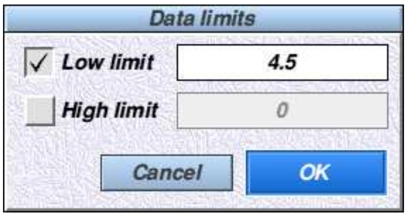
3.3 Data Manipulation

Under data manipulation you will find many basic functions that change the values in a variety of ways.

3.3.1 Count multiples (introduced in luafox 1.50)

This function allows you to count multiple occurances of a certain value. When applying to a set of data the result is a two dimensional table with all values of the data set listed only once and the number of their occurances. It can also be used as a simple histogram function just that the ranges can not be set.

3.3.2 Data limits



☑ Low limit 4.5

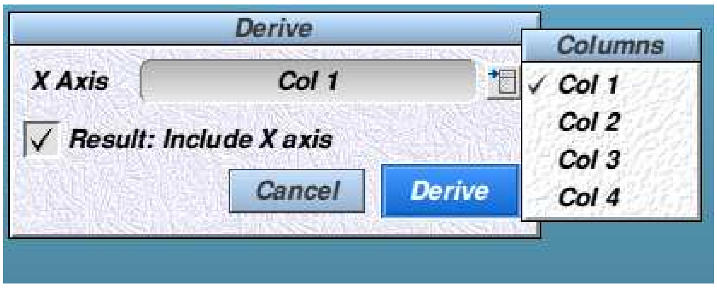
□ High limit 0

Set a low and high limit for the data values

This function allows you to set a low and high data limit. Both limits are optional. If a value is lower than the lower limit its value will be changed to the lower limit. Similarly values higher than the high limit will be set to the high limit.

3.3.3 Derive

To calculate the derivation numerically the derive function requires you to select an x axis first.



X Axis: Col 1

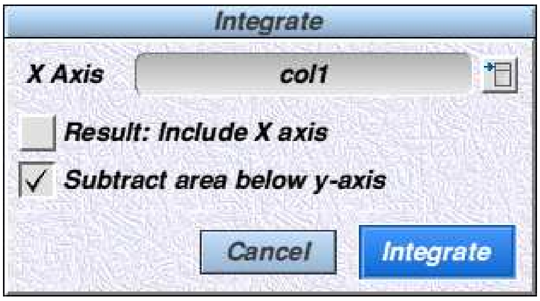
☑ Result: Include X axis

Choose an x axis for the derivation and optionally include a new x axis in the result

The function calculates the slope of a line going through two neighboring data points. Since the slope may not be defined at the data points, it is calculated in the middle between the data points. Therefore the result contains a new x axis and has one data point less than the original data. The function can handle unequally spaced data points. In the dialog box there is an option to include the new x axis in the results, which is highly recommended. This option can cause problems when you have chosen to replace the current selection, because the result has one more column than the initial data and so one column will be lost.

3.3.4 Integrate

The integrate function will integrate the area between the y axis and the data points.



X Axis: col1

□ Result: Include X axis

☑ Subtract area below y-axis

Set the options for calculating the area below a curve

It will take into account the values of the X axis which need to be set by the user before; they do not need to be equally spaced. You can choose whether the area below the Y axis is treated as negative and hence subtracted from the area above the Y axis or whether the sign should be ignored giving the absolute area below the curve. Also here you can choose to include the X axis in the result.

3.3.5 Normalize

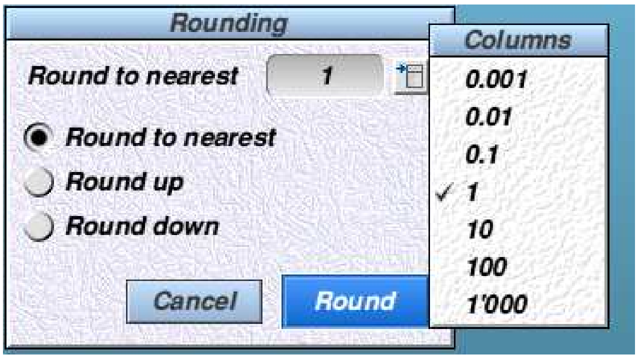
This function will scale the values in a column, row or block of data so that the lowest value becomes 0 and the highest value becomes 1.

3.3.6 Reciprocal

This function calculates the reciprocal (1/x) of all values. Note that there is no reciprocal for the value 0 so that some cells of the result may be empty.

3.3.7 Round

Use this function to round values to the nearest, up (away from zero) or down (towards zero). It is also possible to round to another decimal place. E.g. set "Round to nearest = 0.01" and a value "0.62577" will become "0.63". If you set "Round to nearest = 100" then a value of "157.39" will become "200" and a value "44.82" will become "0".



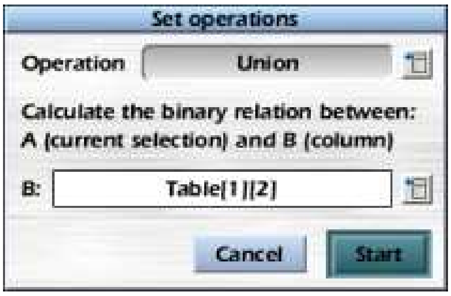
Round to nearest 1

● Round to nearest
○ Round up
○ Round down

Round numbers to nearest, up or down

3.3.8 Set (introduced in luafox 1.40)

There are now four different set operations that can be applied to data:
Union, Intersection, Set difference and Symmetric difference.



Set operations

Operation: Union

Calculate the binary relation between:
A (current selection) and B (column)

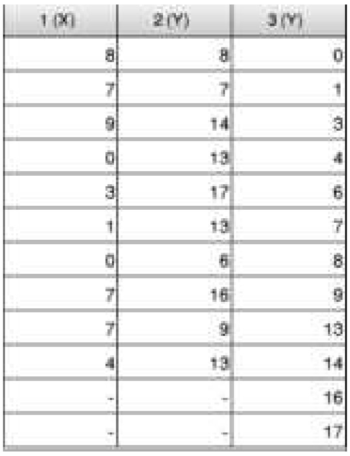
B: Table[1][2]

Choose a set operation and a source column to compare the two data sets

The function works on the current selection and uses a data column as data source.

Union

The Union function will take all values of the currently selected column (A) and the reference column (column B) and generate the result containing all values that are either in column A or B.



1 (X)	2 (Y)	3 (Y)
8	8	0
7	7	1
9	14	3
0	13	4
3	17	6
1	13	7
0	6	8
7	16	9
7	9	13
4	13	14
-	-	16
-	-	17

Column 3 shows the union of the first two columns

It also makes sense to apply the Union operation to the column itself (A = B). In this case you eliminate all double values in that column.

Intersection

The Intersection function will generate a result containing only those elements that are found in both the selected and reference column.

Set difference

The Set difference function will output all values that are found in the selected column but not in the reference column.

Symmetric difference

This function is similar to the Set difference but will output all values that are either in the selected or the reference column.

3.3.9 Subtract (introduced in luafox 1.21)

Subtract a fix value or the lowest or highest value from a given data selection. This can be usefull if you want to subtract the background from a data set.

3.4 Statistics

luafox provides some basic statistical functions that can be applied to columns, rows and blocks of data.

3.4.1 Cusum

Cusum calculates the cumulated sum. In a column of data the first cell will remain unchanged, the second cell will contain the sum of cell 1 and 2, the third cell will contain the sum of the first three cells and so on.

3.4.2 Min, Max

This function will just find the lowest or highest value of a column, row or in a block of data.

3.4.3 Mean

Use this function to calculate the mean value. It is calculated by summing up all values and dividing them by the number of values.

3.4.4 Geometric mean

To calculate the geometric mean use this function. It will multiply n data values and calculate the nth root of the product. Remember that the geometric mean will be 0 only if one of the data values is 0.

3.4.5 Median

The median is just the middle value of a number of values that have been sorted before, if the total number of values is odd. For even number of values the number above the middle and below the middle are added and devided by 2 to calculate the median.

3.4.6 Variance, Variance_empiric

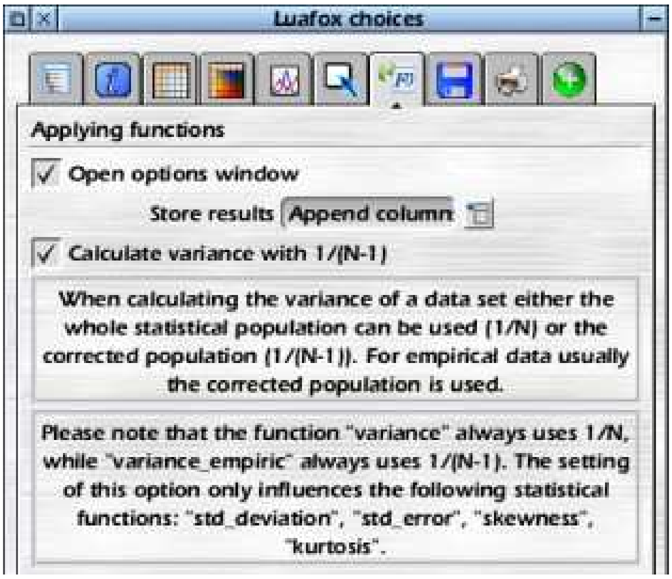
There are two ways of calculating the variance of a given data set. The whole statistical population can be used ($\frac{1}{N}$) or the corrected population ($\frac{1}{N-1}$). The Variance function will always use ($\frac{1}{N}$) while Variance_empiric will use ($\frac{1}{N-1}$). These two funtions are not influenced by the configuration setting described in the next paragraph.

3.4.7 Standard deviation and Standard error, Skewness and Kurtosis

Calculates the standard deviation and the standard error of data values. Depending on the setting of the main configuration the calculation of the standard deviation and error will be based on the uncorrected or corrected variance. The same is true for the skewness and kurtosis.

The Skewness, or third moment, calculates the asymmetry of a normal distribution. So it indicates whether there is more data on the left or right side of the mean value than you would expect from a normal distribution.

The Kurtosis indicates whether data is spread in wider or narrower than one would expect from a normal distribution. So it indicates whether there is a sharp peak or a "flat" maximum.



Applying functions

☑ Open options window

Store results: Append column

☑ Calculate variance with 1/(N-1)

When calculating the variance of a data set either the whole statistical population can be used (1/N) or the corrected population (1/(N-1)). For empirical data usually the corrected population is used.

Please note that the function "variance" always uses 1/N, while "variance_empiric" always uses 1/(N-1). The setting of this option only influences the following statistical functions: "std_deviation", "std_error", "skewness", "kurtosis".

Main configuration to choose the (un-) corrected variance

3.4.8 Sum

Calculates the sum of the data values

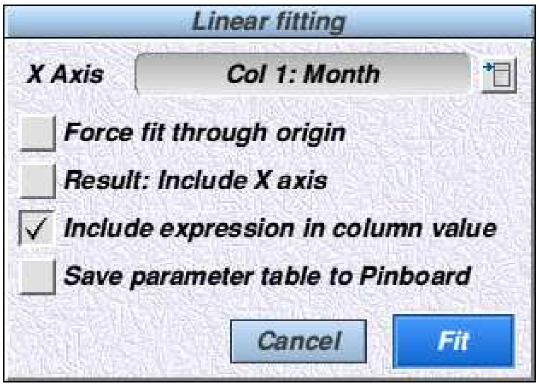
3.5 Fitting

The fitting function provides a way of fitting data values to a curve by adjusting the curve parameters. luafox supports linear and polynomial fitting.

3.5.1 Linear fitting

The linear fitting function will fit a line (y = a + b*x) to the given data set.

There are several options that can be made for the fitting process. The first option forces the linear fit to go through the origin by setting the parameter a to 0. The second option allows you to include the x axis in the results.



X Axis: Col 1: Month

□ Force fit through origin

□ Result: Include X axis

☑ Include expression in column value

□ Save parameter table to Pinboard

Options for linear fitting

The fitting function calculates the parameters a and b and calculates the y values for the given x axis. If you set the option to include the expression in the column value you can recalculate the column by pressing the refresh key. This is especially useful if you change or extend the x column.

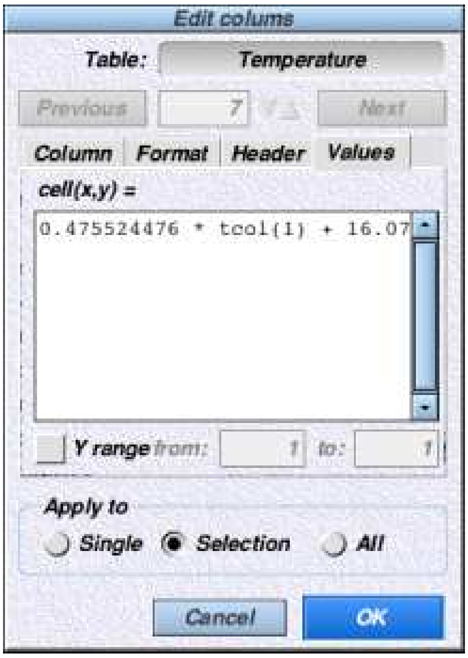


Table: Temperature

7

cell(x,y) =

```
0.475524476 * tcol(1) + 16.07
```

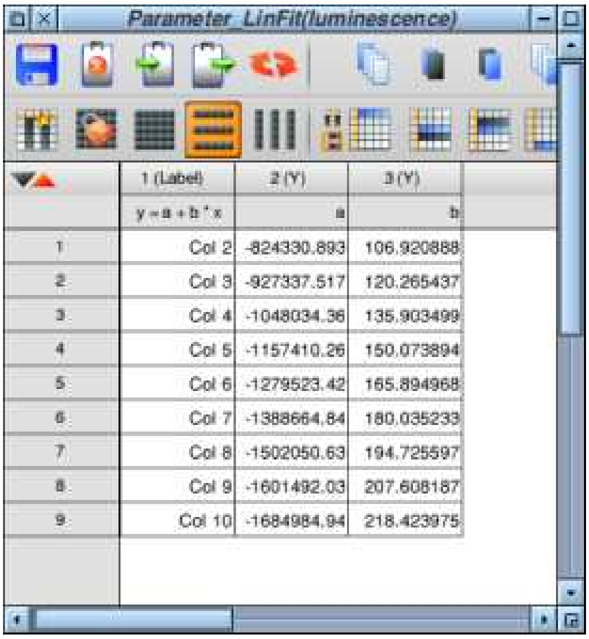
□ Y range from: 1 to: 1

Apply to

○ Single ● Selection ○ All

The expression can be put into the column values

Another way to keep the fitting parameters is to save a parameter table to the Pinboard window.

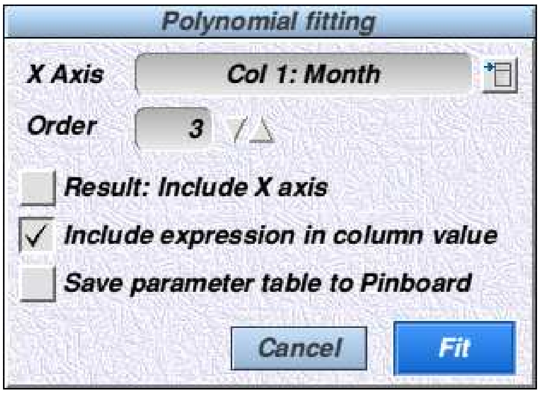


	1 (Label)	2 (Y)	3 (Y)
	y = a + b * x	a	b
1	Col 2	-824330.893	106.920888
2	Col 3	-927337.517	120.265437
3	Col 4	-1048034.36	135.903499
4	Col 5	-1157410.26	150.073894
5	Col 6	-1279523.42	165.894968
6	Col 7	-1388664.84	180.035233
7	Col 8	-1502050.63	194.725597
8	Col 9	-1601492.03	207.608187
9	Col 10	-1684984.94	218.423975

Parameter window showing the fitting parameters for all columns

3.5.2 Polynomial fitting

The polynomial fitting function is very similar to the linear fitting.



X Axis: Col 1: Month

Order: 3

□ Result: Include X axis

☑ Include expression in column value

□ Save parameter table to Pinboard

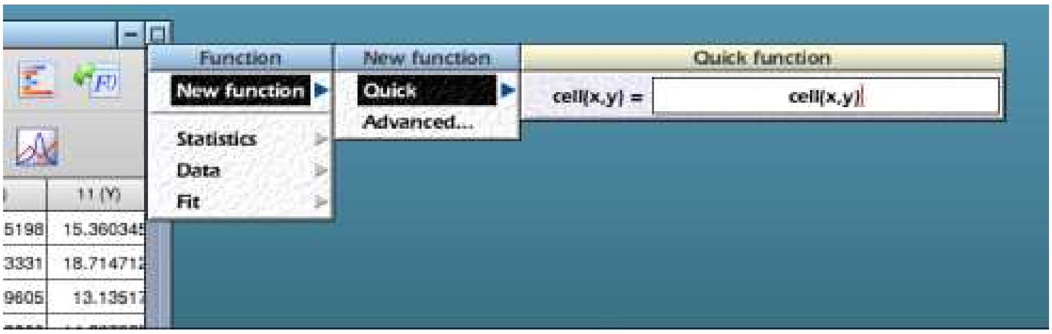
Dialog box to set the parameters for polynomial fits

You can set the order of the polynom that you would like to use for fitting. An order of 3 will use the function: y = a + b*x + c*x^2 + d*x^3. The other options have already been explained in the section about linear fitting.

3.5.3 User defined functions

luafox allows users to add their own functions. If you want to define a simple function that quickly changes the cell values you can use the quick function:

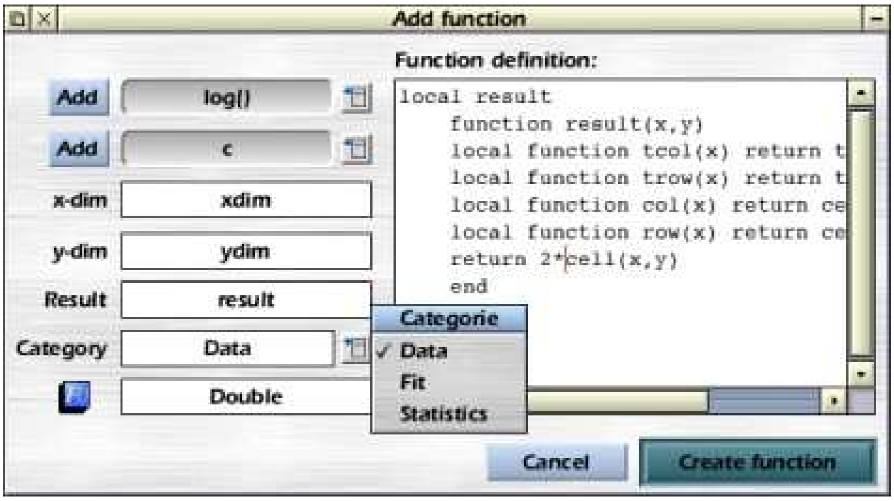
The quick function is available from the function icon of all tables. It will execute the function directly to the current data selection. You can enter values and expression which may use the cell values or refer to the data of other tables. When you call the function menu of the Project Manager it is also possible to save the function as an object and edit it if necessary.



cell(x,y) = cell(x,y)

Use the quick function to apply simple changes

On the function menu there is also a second entry opening the advanced function dialog. Here you can see a lot of options. It is also possible to create a function here very quickly without entering a lot of settings. The text of the function definition is inserted by default. In the screenshot only the text `2*` was added just before `cell(x,y)`. This function will just multiply all cell values by two and has therefore been called "Double". You can then choose an existing categorie or define your own one. Your function will then automatically added to the function menu available from the project manager and every table. All you have to do is to press the create function button now and the function will be added to the Project Manager.



Add: log()
Add: c
x-dim: xdim
y-dim: ydim
Result: result
Category: Data
Double

Function definition:

```
local result
    function result(x,y)
    local function tcol(x) return t
    local function trow(x) return t
    local function col(x) return ce
    local function row(x) return ce
    return 2*cell(x,y)
    end
```

Creating an advanced user function

Let's have a closer look at the function definition. This allows you to use the lua programming language and to perform very complex operations.

If you want to use all of its power to write your own functions you should refer to the lua programming manual.

Basic definitions

The expression `local result` defines the variable "result" as a local variable that is only valid inside the user defined function. In the next line the variable result is used as a function name. This is the function that will be called when the function is dragged to a selection or applied otherwise. If you need to change the name of this function change: 1. the variable name after `local`. 2. the variable name after the `function` command and 3. the variable name in the writeable field on the left hand side of the window. Here the function name is entered that will be called when the function is applied. Usually you do not have to change the name but it is possible to define more than one function in the Function definition text field and it would be not clear which of these functions is the one to be called.

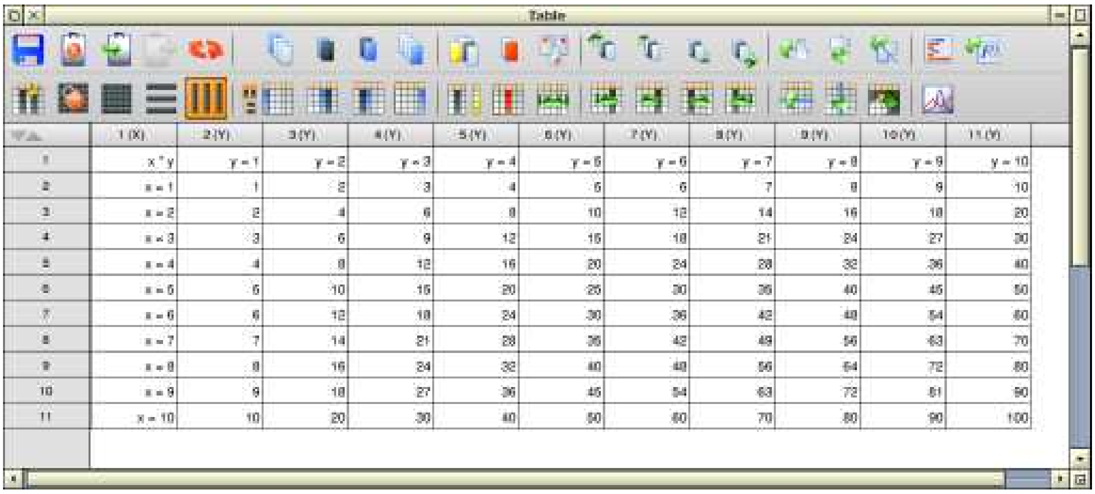
There are two arguments of the result function: x and y, which are the x (column) and y (row) numbers of the selection. Try to change the line containing "return" into `return x`. If you apply this function the first selected row will be filled with a value of 1, the second with 2 and so on.

There are four lines starting with `local function` that define secondary functions: col(), row(), tcol() and trow(). They are described in detail in the section about editing column values. As a reminder: The `col(n)` function will access values of the nth selected column. The `tcol(n)` function will access values of the nth column of the current table, independent of the selection. Similar the cell function: `cell(x,y)` will access only the selected values, `tcell(x,y)` the cells of the table. The same is true for the row() and trow() functions. If you do not use these secondary functions you can delete their definition. The cell() and tcell() functions are defined by default and will also work if you delete the four local function definitions.

It is also possible to use a variable as return value. E.g. the following function definition will create a multiplication table:

```
local result
    function result(x,y)
    local value
    if x == 1 and y == 1 then
      value = "x * y"
    elseif x == 1 then
      value = "x = "..(y-1)
    elseif y == 1 then
      value = "y = "..(x-1)
    else
      value = (x-1)*(y-1)
    end
    return value
    end
```

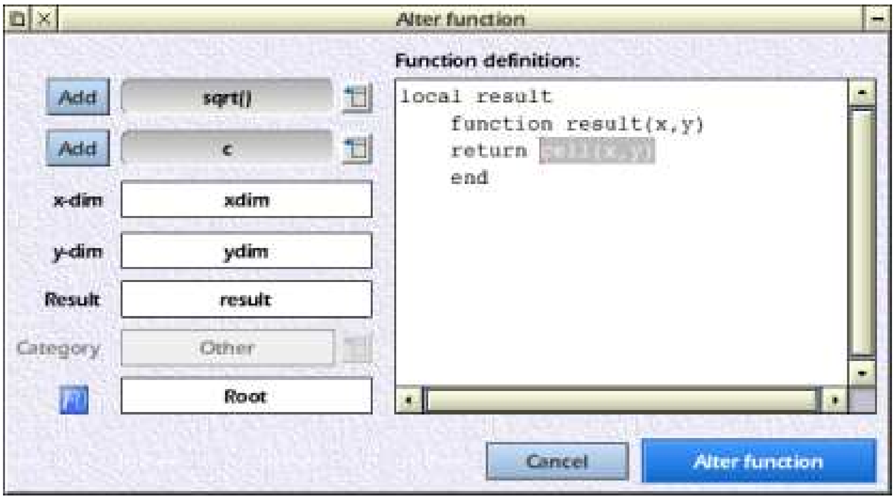
Here a local variable `value` is defined. Depending on the x and y values the variable is filled with strings or numbers. In the top left corner (x = 1 and y = 1) the expression "x * y" is written. The first column is then filled with the row number-1 and the first row with the column number-1. The rest of the table is filled with x-1 and y-1 multiplied.



	1 (X)	2 (Y)	3 (Y)	4 (Y)	5 (Y)	6 (Y)	7 (Y)	8 (Y)	9 (Y)	10 (Y)	11 (Y)
1	x * y	y = 1	y = 2	y = 3	y = 4	y = 5	y = 6	y = 7	y = 8	y = 9	y = 10
2	x = 1	1	2	3	4	5	6	7	8	9	10
3	x = 2	2	4	6	8	10	12	14	16	18	20
4	x = 3	3	6	9	12	15	18	21	24	27	30
5	x = 4	4	8	12	16	20	24	28	32	36	40
6	x = 5	5	10	15	20	25	30	35	40	45	50
7	x = 6	6	12	18	24	30	36	42	48	54	60
8	x = 7	7	14	21	28	35	42	49	56	63	70
9	x = 8	8	16	24	32	40	48	56	64	72	80
10	x = 9	9	18	27	36	45	54	63	72	81	90
11	x = 10	10	20	30	40	50	60	70	80	90	100

Multiplication table created by a user function

When writing a function you can quickly insert mathematical functions or constants into the text area. On the left hand side of the window you will find two menus which let you choose a mathematical function or constant. If you click on the add button the expression will be inserted at the cursor position. In case of the mathematical function there is also the option to select a piece of text first. In this case the function will enclose the current selection.



x-dim: xdim

y-dim: ydim

Result: result

Category: Other

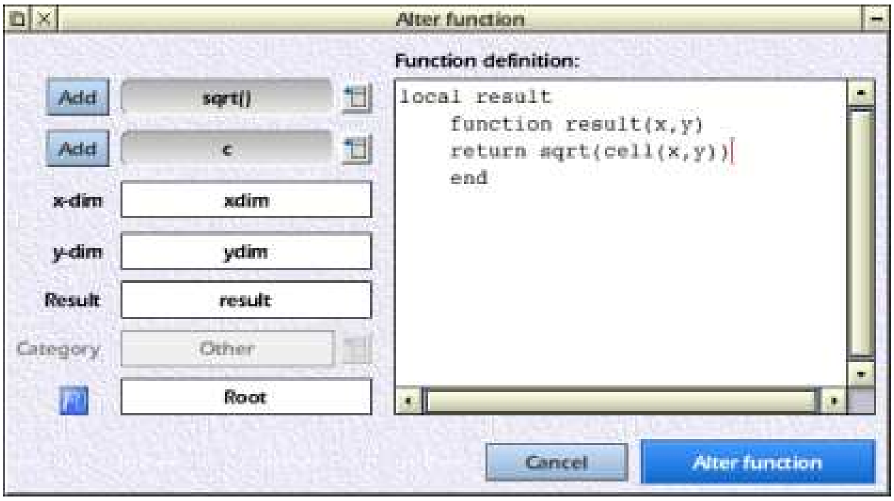
Root

Function definition:

```
local result
    function result(x,y)
    return cell(x,y)
    end
```

Select a piece of text...

There are two more fields on the left hand side: x-dim and y-dim. These fields are filled with the `xdim` and `ydim` variable. Both are predefined variables that can be used inside a function. The variable `xdim` contains the number of selected columns, `ydim` the number of selected rows. The fields on the left side tell luafox how large the result is. In many cases the result will have the same size as the data selection, so these variables are written in the field by default. But if you think about a function like the sum() function then you will understand that it can be helpful to set the size of the result.



x-dim: xdim

y-dim: ydim

Result: result

Category: Other

Root

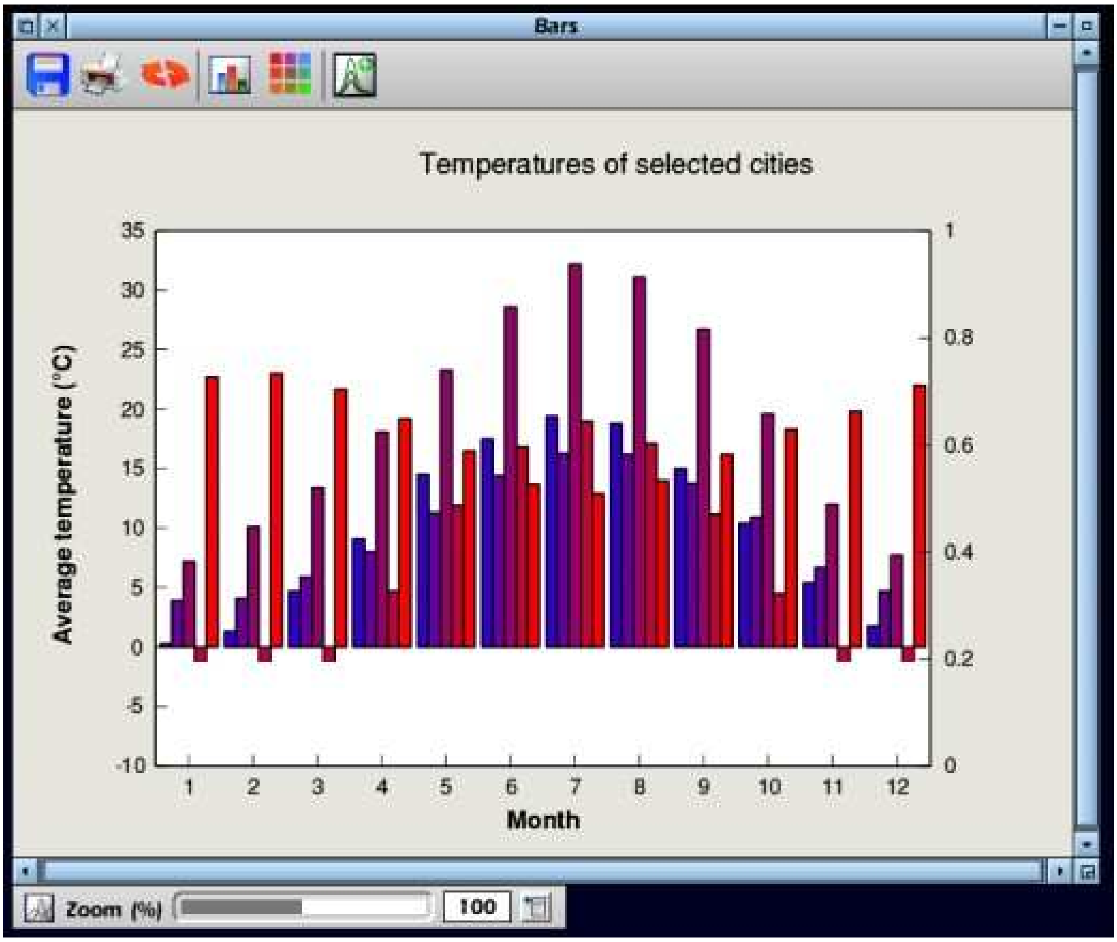
Function definition:

```
local result
    function result(x,y)
    return sqrt(cell(x,y))
    end
```

...and click on the add button to enclose the selected text in the mathematical function

There is one other predefined variable which is called `mode`. It can be "col", "row" and "block" depending on the selection mode. You can use this inside your function definition if you want to take the selection mode into account.

4 Graphs



Main window of a graph

Every graph is shown in a new window containing two toolboxes. The toolbox at the bottom can be used to change the zoom factor of the graph. The toolbox at the top lets you save, print and refresh the graph, change its style and the data shown as curves or bars.

4.1 Save, Print and Refresh

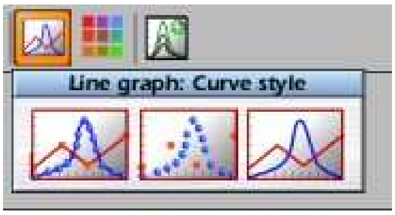
The meaning of the first buttons from the left is very similar to the table toolbar. The disc icon lets you save the graph as a draw file. This allows you to export the graph to almost all RISC OS applications that can deal with graphics.

The print button calls !DrawPrint, please refer to the table section for more information about printing from luafox and also to the manual supplied with !DrawPrint. Just one hint: It the icon is greyed out open a filer window containing !DrawPrint, it has to be seen by the filer before you are able to use it.

The Refresh button is used to update the graph and plot it again. This is especially useful if data values have been changed and need to be taken into account.

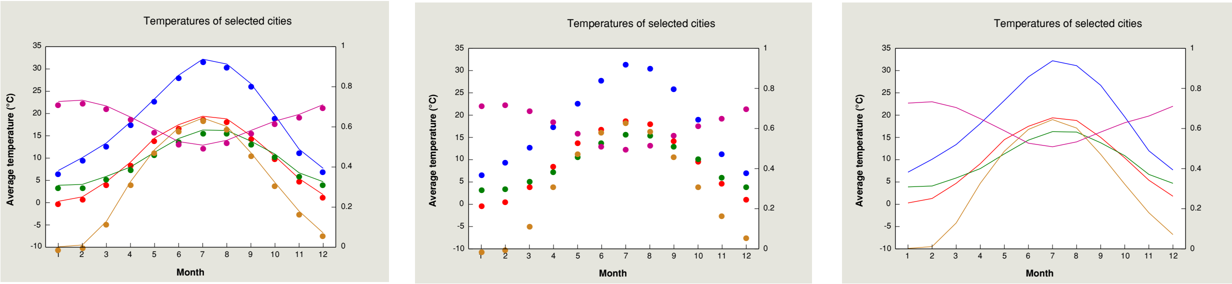
4.2 Curve and Bar style (introduced in luafox 1.2, update: luafox 1.21)

The appearance of a graph depends on a huge number of settings. They can all be changed in the Edit Style dialog described below. However, luafox 1.2 adds two shortcuts for changing the appearance of a graph with only two mouse clicks.



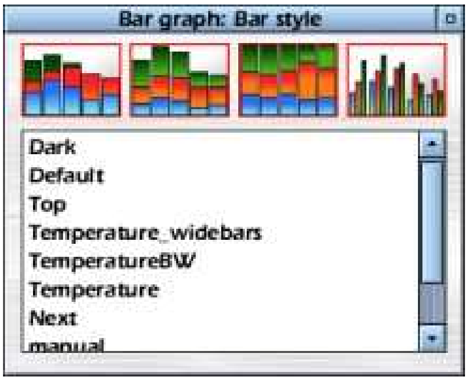
Quickly change the curve style

A click on the curve style button opens a window showing three different styles you can choose from: Scatter graph, line graph or scatter & line.



The same data displayed with different curve styles

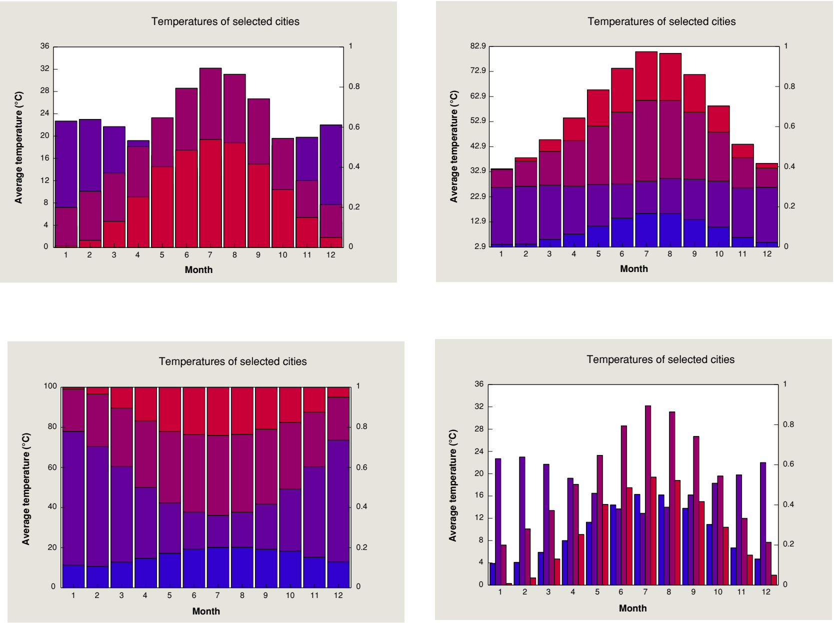
The bar graph introduced in luafox 1.2 offers you similar options: You can choose (from left to rigth) to plot the bars behind each other, on top of each other (stacked), relatively stacked or next to each other. The styles will be discussed in more detail later.



Dark
Default
Top
Temperature_widebars
TemperatureBW
Temperature
Next
manual

Quickly change the bar style

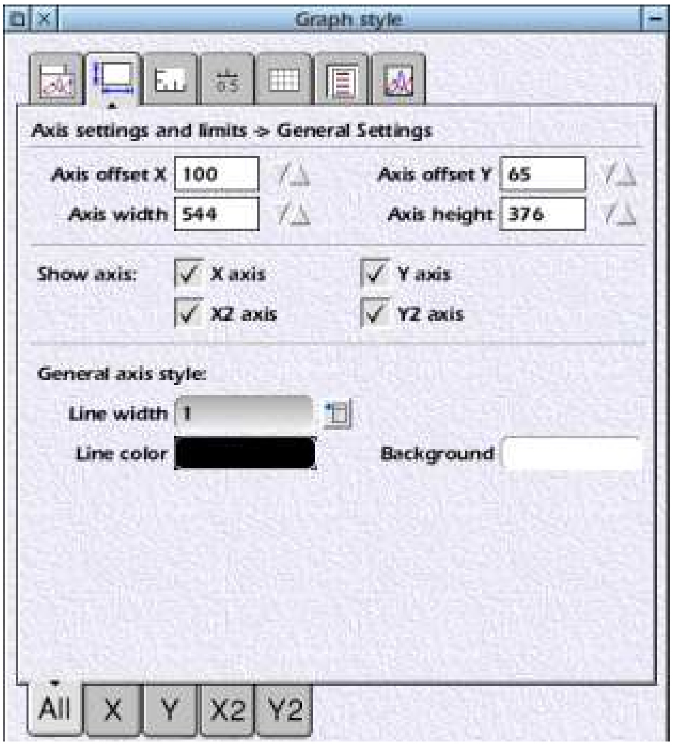
New in luafox 1.21 is the option to choose a style before you plot a graph. To see the list of available styles just maximise the Bar style window as shown above and click on a style.



The same data displayed in four different bar styles

4.3 Edit style

The appearance of the graph is controlled by a graph style that defines all graph settings. For editing the style ConfiX is used, a general configuration utility found also in many other applications.



Axis settings and limits -> General Settings

Axis offset X 100
Axis offset Y 65
Axis width 544
Axis height 376

Show axis: ✓ X axis ✓ Y axis
✓ X2 axis ✓ Y2 axis

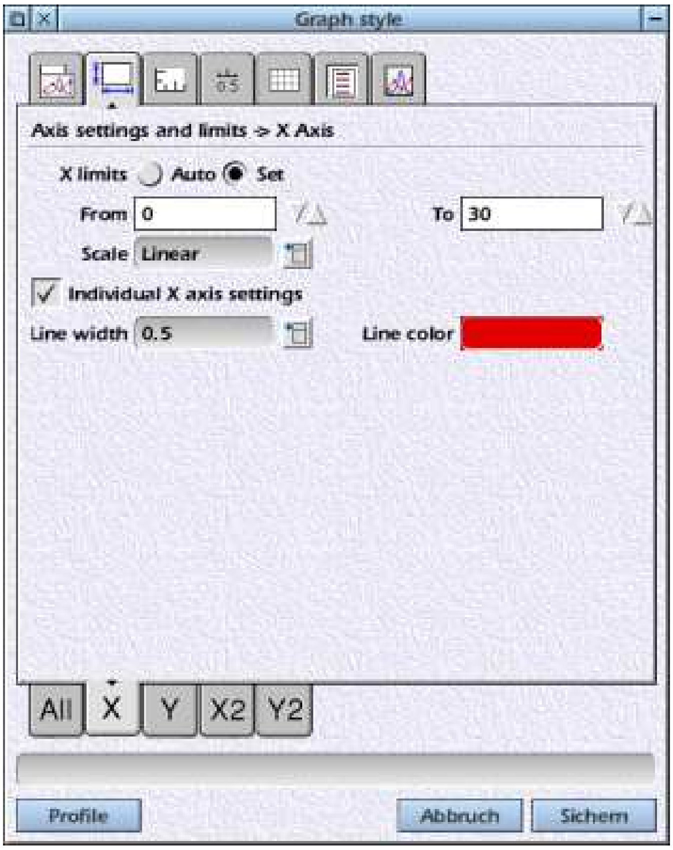
General axis style:
Line width 1
Line color
Background

Configuration window with graphical tabs at the top and near the bottom of the window. The lower tabs allow you to configure the graph in every detail

The window to edit the graph style has a number of graphical tabs in the top part of the window.[3] If you move the mouse over the tabs you will see their meaning in the help display field of the window.

Sometimes there are also some additional tabs near the bottom of the window (sub tabs). Using these tabs you can set even more options.

The general problem when dealing with graphs is that there are so many options that need to be set. If you just think about the ticks. These are the small lines that divide an axis into smaller parts. They can be inside or outside of the graph. You can have only major ticks or also minor ticks. All need to have their own line width and color. Also you may want to have different tick settings for the different axis. The challenge when dealing with graph options is to find a way that keeps setting the options simple but still allows you to be very flexible. luafox tries to solve this by general and specific styles.



Axis settings and limits -> X Axis

X limits ○ Auto ● Set

From 0 To 30

Scale Linear

☑ Individual X axis settings

Line width 0.5 Line color 🟥

Set individual options for singe a axis

On the first sub tab, which is often called "All" you can set the general settings, in this example you can configure which axis you want to show and set a general axis style consisting of the line width and color. Usually you want all axes in a graph to have the same color and width so you only need to care about the general settings.

If you have special needs and you want to have differently colored axes you can choose the axis from the sub tab and tick the option for individual settings. This will overwrite the general settings and you can now specify the line width and color specifically for one axis.

[3] If it looks different on your computer please reconfigure ConfiX to show graphical tabs. The ConfiX application can usually be found in !Boot.Resources.

In the following sections all graph options are introduced and explained in details. Additionally the effects on an example graph are directly shown.

Also note that in luafox 1.2 bar graphs have been added. All style files are valid for line and bar graphs. This is much easier than to support different kinds of styles, for line graphs, for bar graphs and probably also for other graphs that may be added in future. Having only one style file for line and bar graphs also has the advantage that both types share most of the features like the tick settings, background colours etc. So you could define a "red" style which shows red curves and red bars and maybe a red frame and a "blue" style replacing all red colours by blue ones. This way you just change the style from red to blue or vice versa and you do not need to care whether you have a line or bar graph. What might be confusing is that the edit style configuration called from a line graph also contains settings for bars. They exist but are just not applied to the line graph.

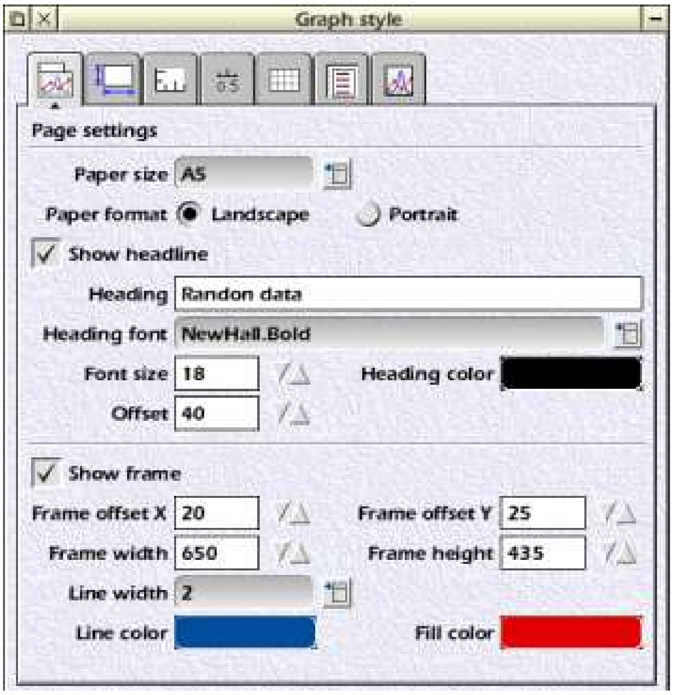
Please also note that a new graphical tab for bar styles has been added in version 1.2 which is not shown on all screenshots but just on the new ones and those actually dealing with bars.

4.3.1 Page settings

Choose a paper size between DIN A0 and A5 for the graph and choose whether the paper format is Landscape or Portrait.

You can add a header line by clicking the option. Enter the heading and choose a font, the font size and a color. The offset defines the distance between the upper Y axis and the heading.

There is also the option to show a frame around the graph and select its position, dimension and colors as shown in the example:



Page settings

Paper size A5

Paper format ● Landscape ○ Portrait

☑ Show headline

Heading Randon data

Heading font NewHall.Bold

Font size 18 Heading color ⬛

Offset 40

☑ Show frame

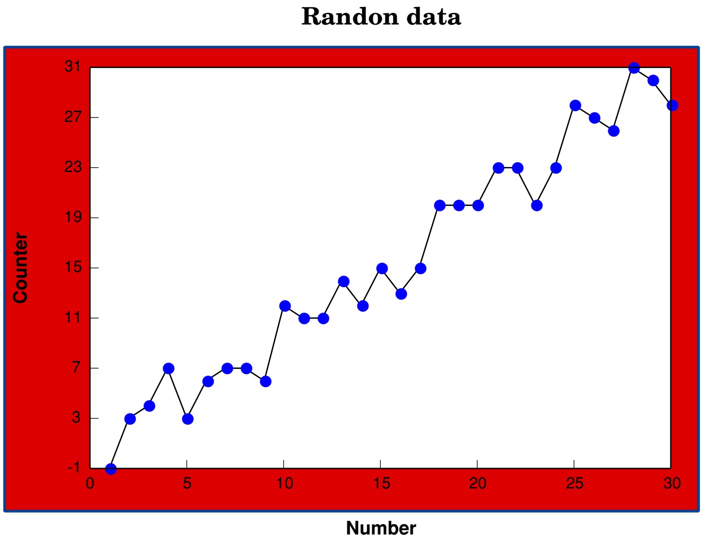
Frame offset X 20 Frame offset Y 25

Frame width 650 Frame height 435

Line width 2

Line color 🟦 Fill color 🟥

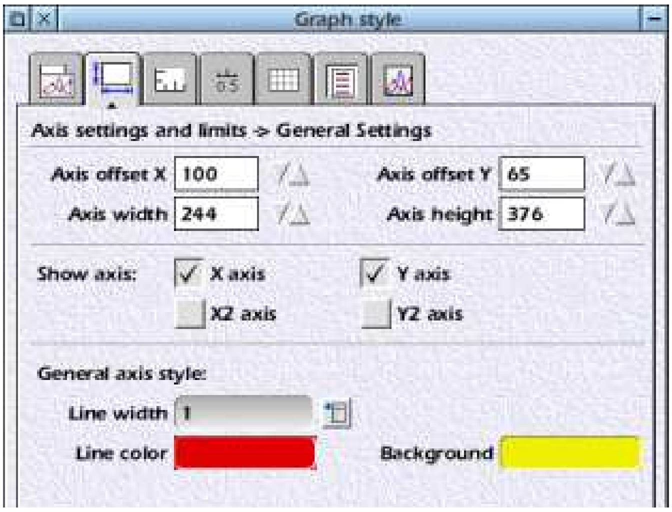
Settings for the page, header line and the frame



Graph with the style defined as shown above

4.3.2 Axis settings and limits

In the second tab you can control the axis settings and the data limits for the axis. Axis offset X and Y defines the distance of the axis from the left and bottom border. You can also set the width and height of the graph here, the data points will be scaled accordingly.



Graph style

Axis settings and limits -> General Settings

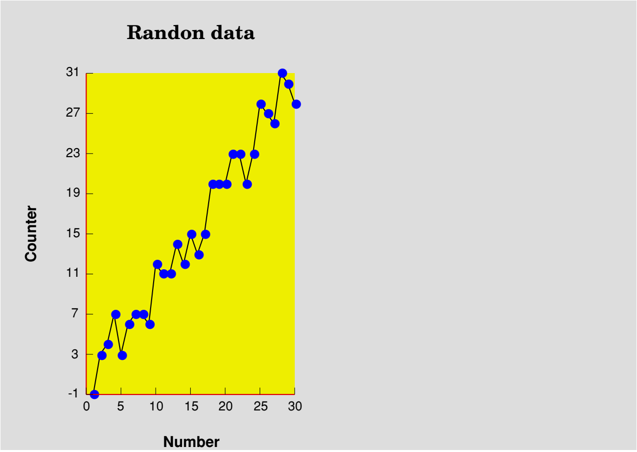
Axis offset X 100
Axis offset Y 65
Axis width 244
Axis height 376

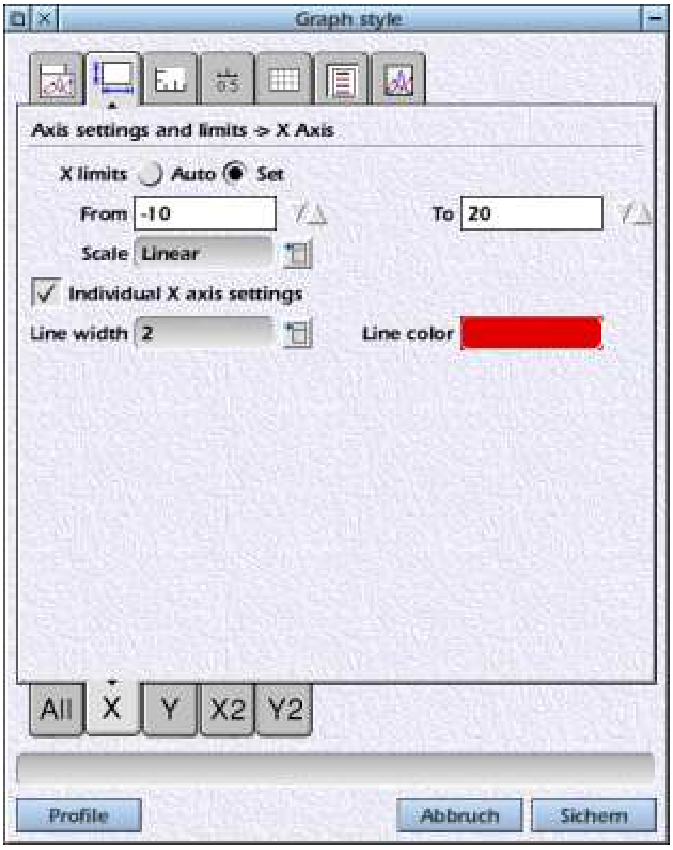
Show axis: ☑ X axis ☑ Y axis
□ X2 axis □ Y2 axis

General axis style:
Line width 1
Line color 🟥
Background 🟨

Set the position and size of the graph. Configure which axis to show on the graph and set the general axis style

The second section allows you to select which axis to show on the graph.
In the last section you can set the axis line width and color as well as the graph background color.





Axis settings and limits -> X Axis

X limits ○ Auto ● Set

From -10 To 20

Scale Linear

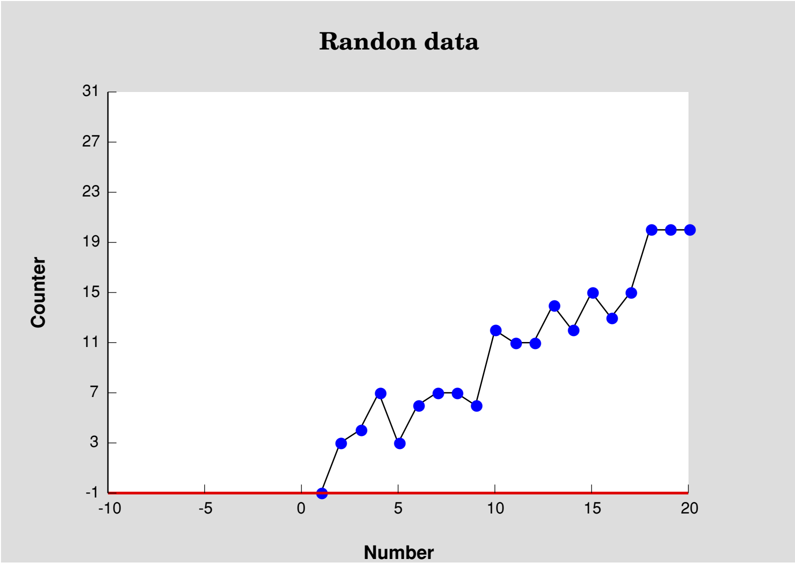
☑ Individual X axis settings

Line width 2 Line color 🟥

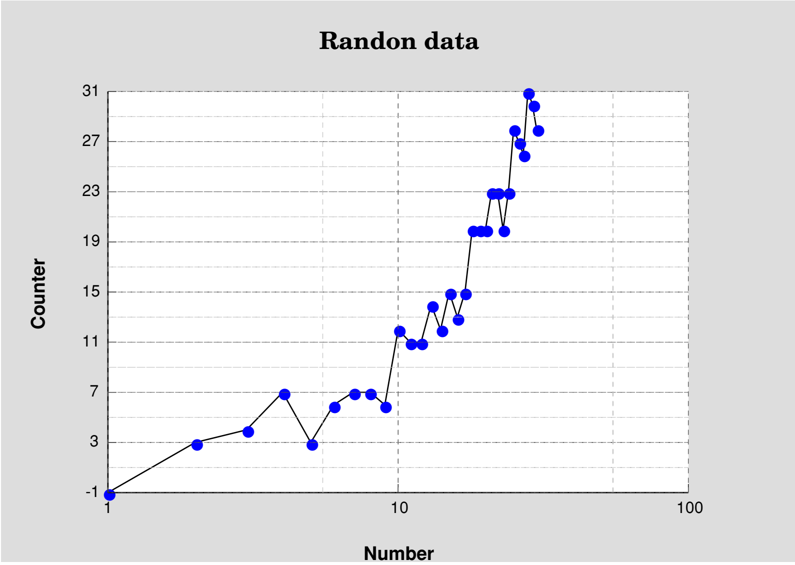
Set the axis limits and an individual axis style

On the sub tabs you can set the data limits of the individual axis by defining a lower and upper limit. By default the limits are set automatically according to the data values. The axis are scaled such as to show all selected data points. The scaling can also be changed from Linear to Logarithmic.

If you select to show an individual X axis you can set an alternative line width and color.



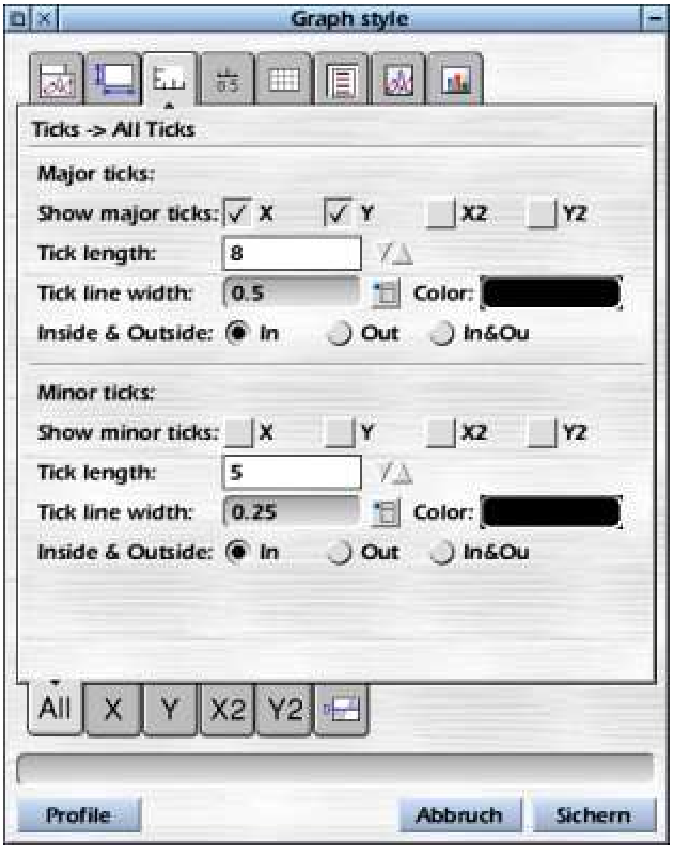
Data limits on the X axis set manually. Individually colored X axis.



Logarithmic scale on the X axis. Gridlines are shown to emphasize the scaling and will be explained in one of the following sections

4.3.3 Ticks

Ticks are small lines that divide the axis into sections usually associated to specific values. There can also be minor ticks that further divide those sections.



Ticks -> All Ticks

Major ticks:

Show major ticks: ☑ X ☑ Y □ X2 □ Y2

Tick length: 8

Tick line width: 0.5 Color:

Inside & Outside: ● In ○ Out ○ In&Ou

Minor ticks:

Show minor ticks: □ X □ Y □ X2 □ Y2

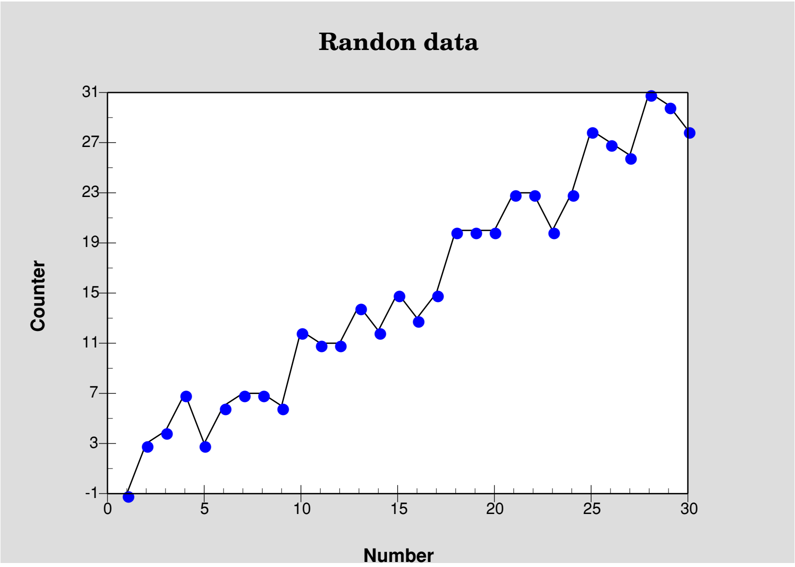
Tick length: 5

Tick line width: 0.25 Color:

Inside & Outside: ● In ○ Out ○ In&Ou

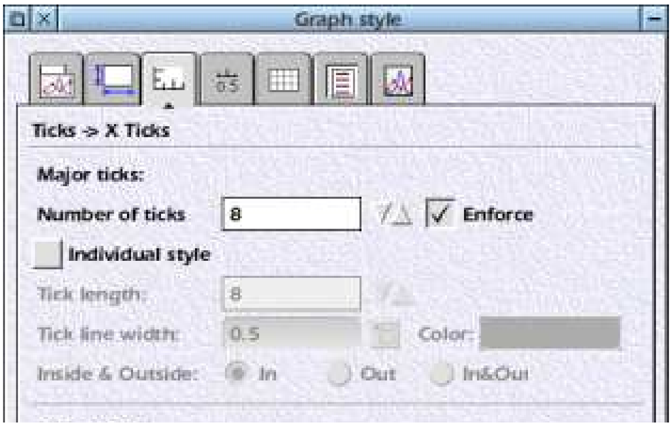
General settings for the major and minor ticks

In the first sub tab you can define on which axis you want to display major or minor ticks. Also you can set the tick length and line width as well as the color and whether the ticks are shown inside the graph, outside or both.



Graph plotted with the settings as shown above

In the sub tabs the number of ticks to be shown can be defined. The setting for the major tick is a little bit special because the number of ticks shown might be different from the number defined in the configuration if the enforce option is not ticked. This is because in most cases values are plotted on the X axis as well and only steps of 1,2 and 5 are recommended to use for labelling the axis. The number specified is not completely ignored because luafox will display a number of ticks that is close to the number you specified in the configuration. As an example that plot above is set to display 8 major ticks on the X axis but there are only 7 displayed. You can enforce luafox to display 8 ticks no matter what as shown in the next example:



Graph style

Ticks -> X Ticks

Major ticks:

Number of ticks: 8 ☑ Enforce

□ Individual style

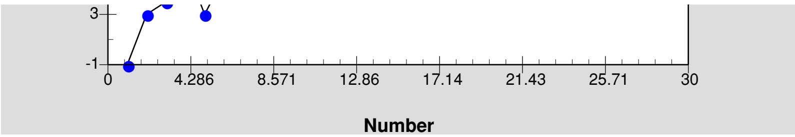
Tick length: 8

Tick line width: 0.5 Color:

Inside & Outside: ● In ○ Out ○ In&Out

Set the number of major and minor ticks here

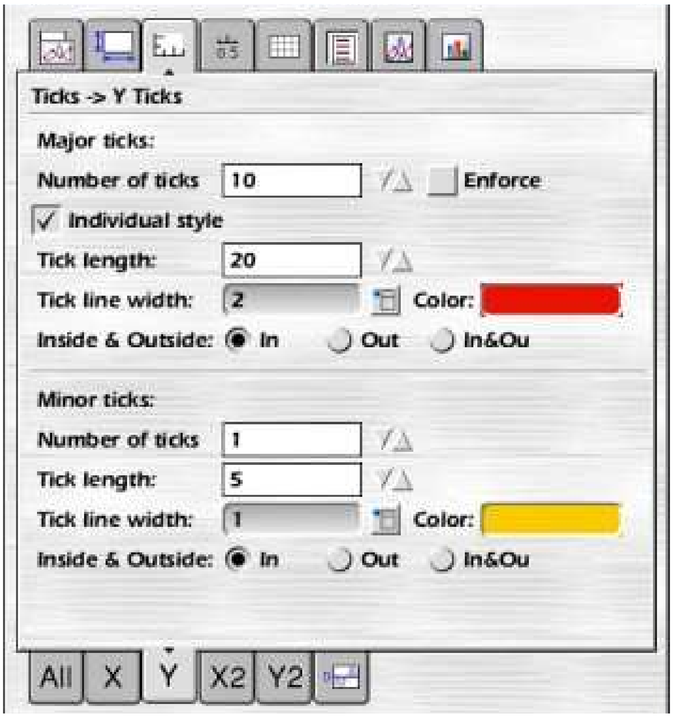
However, enforcing a number of ticks may lead to tick label values that are difficult to handle and read.



Enforcing the number of ticks may lead to unhandy tick label values

The number of minor ticks will always be shown as specified. Still it is good practice to choose them in a way that they represent numbers that can be understood easily.

You can also set the style of the ticks individually as shown below:



Ticks -> Y Ticks

Major ticks:

Number of ticks 10 □ Enforce

☑ Individual style

Tick length: 20

Tick line width: 2 Color: 🟥

Inside & Outside: ● In ○ Out ○ In&Ou

Minor ticks:

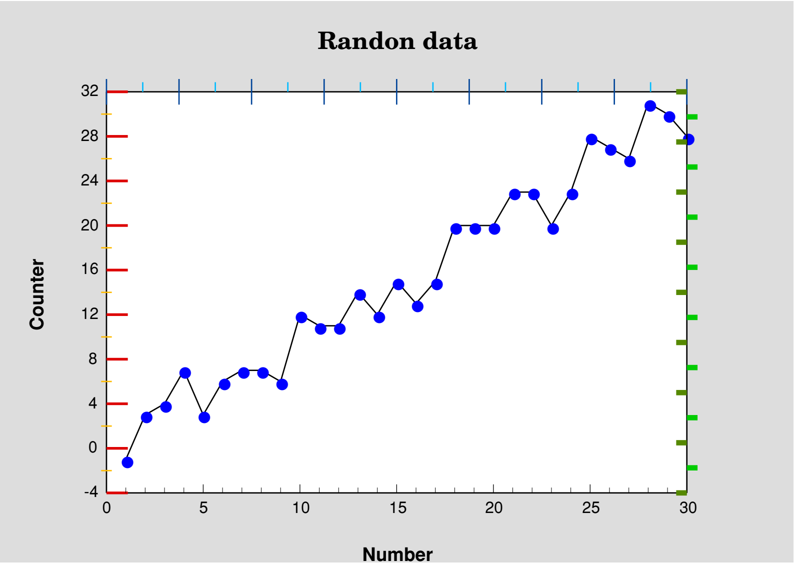
Number of ticks 1

Tick length: 5

Tick line width: 1 Color: 🟨

Inside & Outside: ● In ○ Out ○ In&Ou

Set the individual tick style for the Y axis



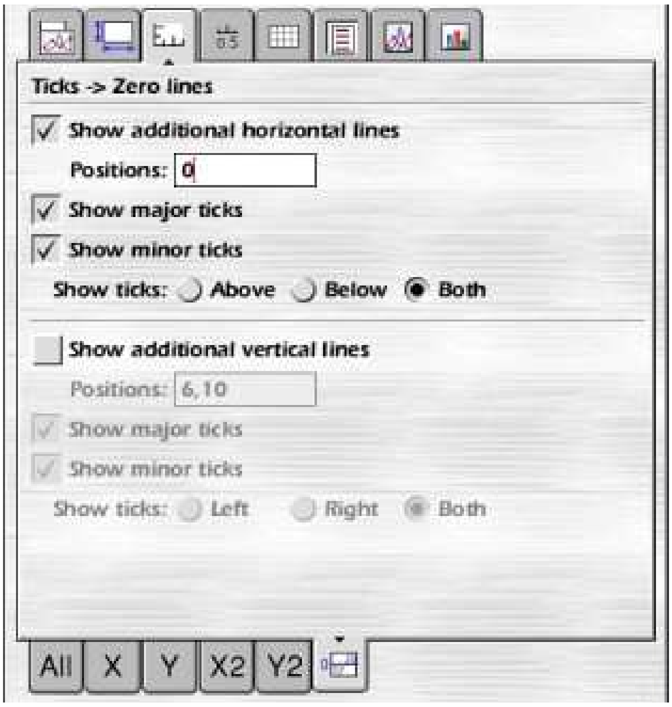
Different tick styles in comparison

Please note that the above example is of course not a good way to present the data. It only shows what is possible with luafox.

4.3.4 Additional lines, Zero line (introduced in luafox 1.2)

In a graph that shows data from negative to positive values on either the X- or Y-axis it may a good idea to plot an additional line at the value 0. This is possible with luafox.

Additional horizontal and vertical lines can be shown in a graph, not only at value 0. Also ticks can be added to the line so that it serves like a central axis.



Ticks -> Zero lines

☑ Show additional horizontal lines

Positions: 0

☑ Show major ticks

☑ Show minor ticks

Show ticks: ○ Above ○ Below ● Both

□ Show additional vertical lines

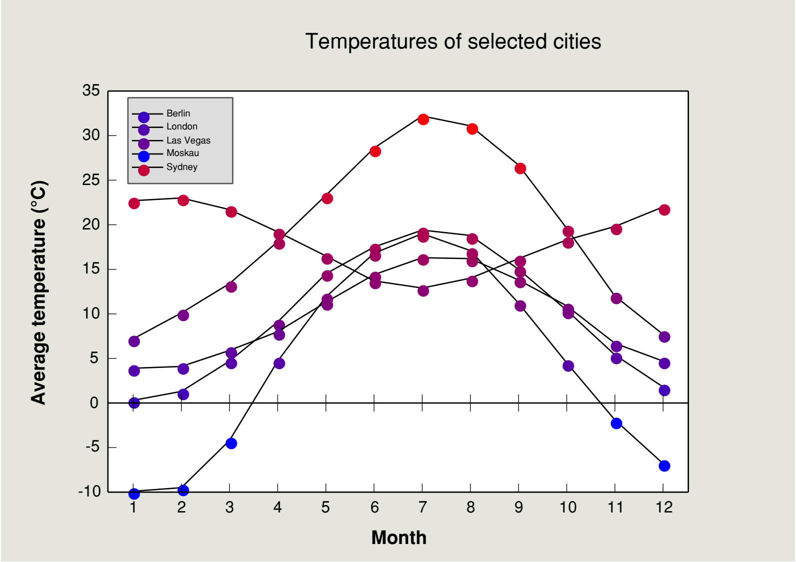
Positions: 6,10

☑ Show major ticks

☑ Show minor ticks

Show ticks: ○ Left ○ Right ● Both

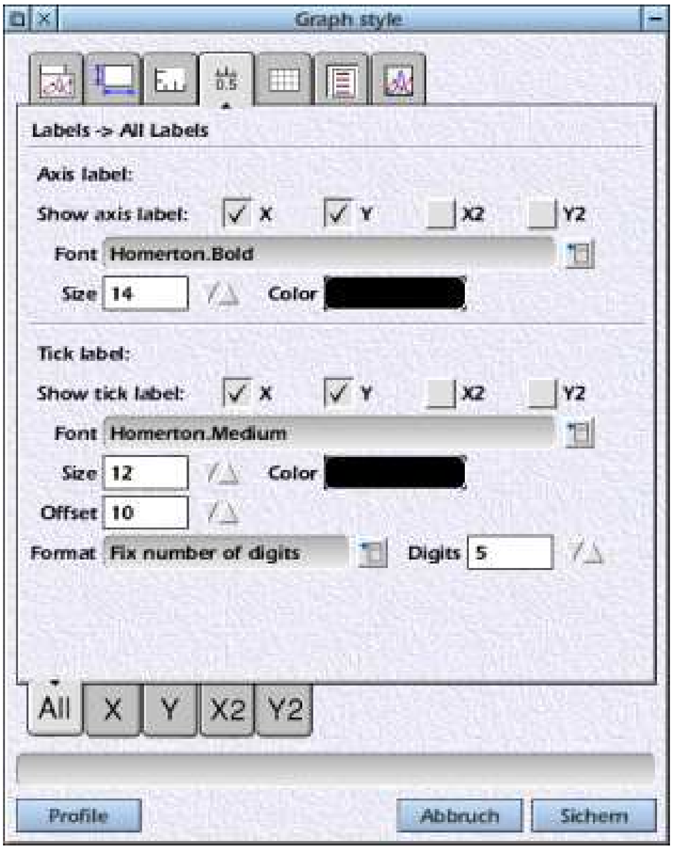
Add additional horizontal or vertical lines to a graph that may also show ticks



Graph with an additional axis at Y-value = 0

4.3.5 Axis and tick labels

The next configuration tab allows you to set the axis and tick labels. The axis labels are usually shown left of or below the axis. In the above example they are set to "Number" and "Counter". Usually you will also find a unit in the axis label, e.g. "Temperature (°C)". The tick labels are shown at the positions of the major ticks.



Labels -> All Labels

Axis label:

Show axis label: ☑ X ☑ Y □ X2 □ Y2

Font Homerton.Bold

Size 14 Color

Tick label:

Show tick label: ☑ X ☑ Y □ X2 □ Y2

Font Homerton.Medium

Size 12 Color

Offset 10

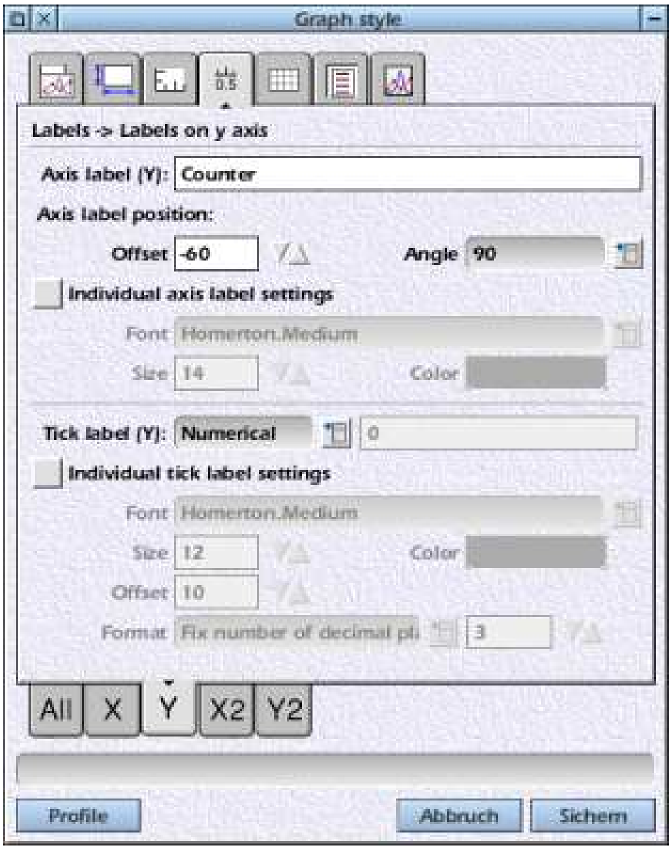
Format Fix number of digits Digits 5

Configuration of axis and tick labels

On the first sub tab you can again specify which labels are to be shown on the axis and what style is used to display them. For the tick labels the number format can also be specified. The offset value defines how far away from the axis the tick labels are plotted. This value is valid for all axes and points away from the axis. Use negative values to show the tick labels inside the graph.

On the sub tabs dedicated to the axes you can set the axis label and the position. Angles of 0,90,-90 and 180 can be chosen to display the axis label.

Of course the axis and tick label style can be set here as well analogously to the other settings described before.



Graph style

Labels -> Labels on y axis

Axis label (Y): Counter

Axis label position:

Offset -60 Angle 90

□ Individual axis label settings

Font Homerton.Medium

Size 14 Color

Tick label (Y): Numerical 0

□ Individual tick label settings

Font Homerton.Medium

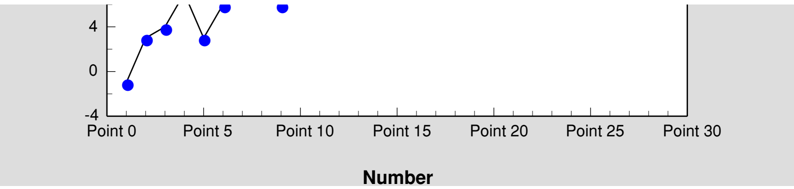
Size 12 Color

Offset 10

Format Fix number of decimal pl: 3

Define axis label, offset and angle

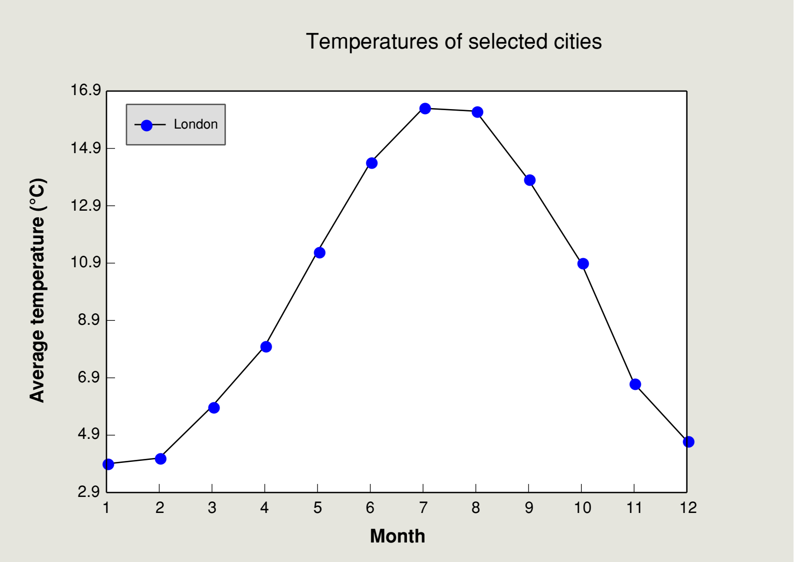
One important setting is the tick label setting which is set to numerical by default, showing the numbers of the X values used to plot the data. Setting this option to user allows you to define your own tick labels by using an expression. An example might be `"Point "..(5*(y-1))` to produce the following tick labels:



Define the tick labels by an user expression

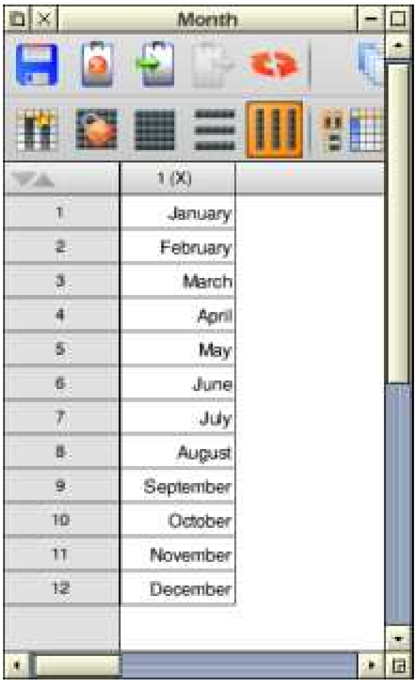
The variable `y` always starts with 1 at the first tick label and will be 2 at the second and so on. Use the variable `n` to get the same values as the numeric setting. So choosing "Numerical" from the menu or "User" with the expression `n` will produce the same tick labels. But this setting enables you e.g. to show smaller values using an expression like `n/1000` and changing the units of the axis label.

It is also possible to access other tables. A nice addition is the special list command which makes table access a little bit easier. Lets take a new data set showing the average temperature of London over the year:



Graph showing the average temperature of London over the year

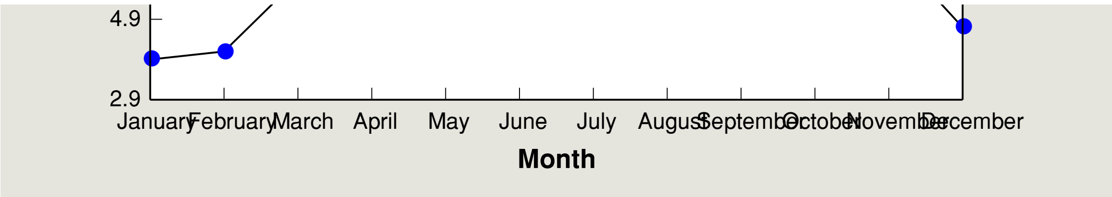
If you create another table containing the month as string:



	1 (X)
1	January
2	February
3	March
4	April
5	May
6	June
7	July
8	August
9	September
10	October
11	November
12	December

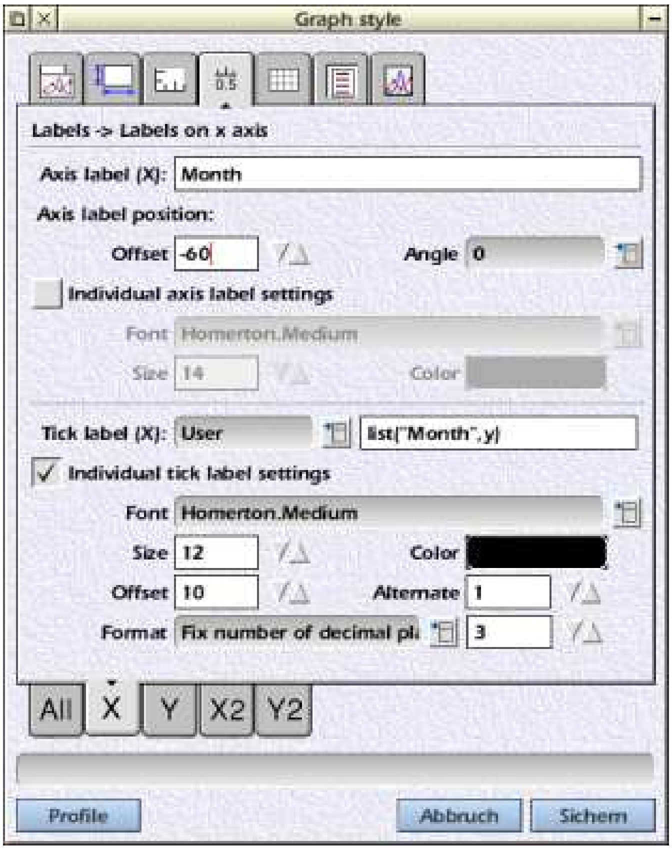
Table with months

If you now enter the expression list("Month",y) the content of the table called "Month" is used to show the tick labels. The list command will always read the values of the first column of the first sheet of a given table. The second argument takes the row number. If the row number is higher than the number of rows it start from the beginning.



It is possible to display the content of other tables as tick labels

The tick labels now show the content of the Month table. But as you can see the characters overlap each other. You can now either reduce the number of major ticks or use an individual tick label setting and set the alternate option to a value higher than 0:



Labels -> Labels on x axis

Axis label (X): Month

Axis label position:

Offset -60 Angle 0

□ Individual axis label settings

Font Homerton.Medium

Size 14 Color

Tick label (X): User list("Month",y)

☑ Individual tick label settings

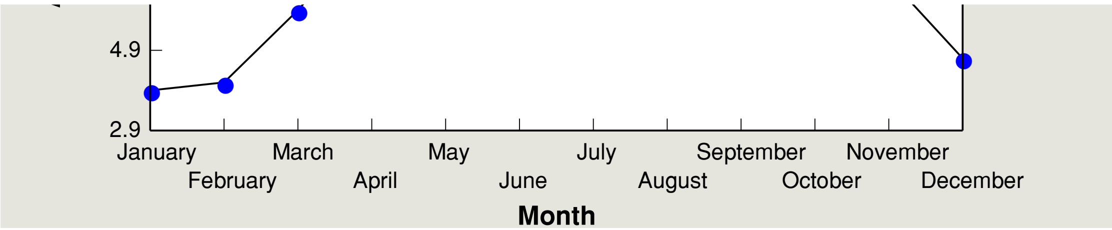
Font Homerton.Medium

Size 12 Color

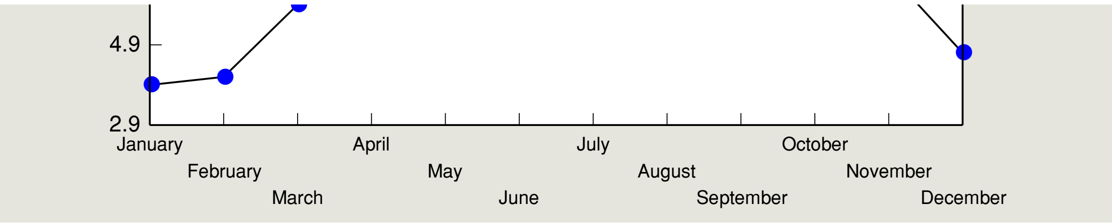
Offset 10 Alternate 1

Format Fix number of decimal pl. 3

Set alternating tick labels if they are too long to be shown in one line. Note that also the offset of the axis label was increased.



Tick labels with an alternate value of 1

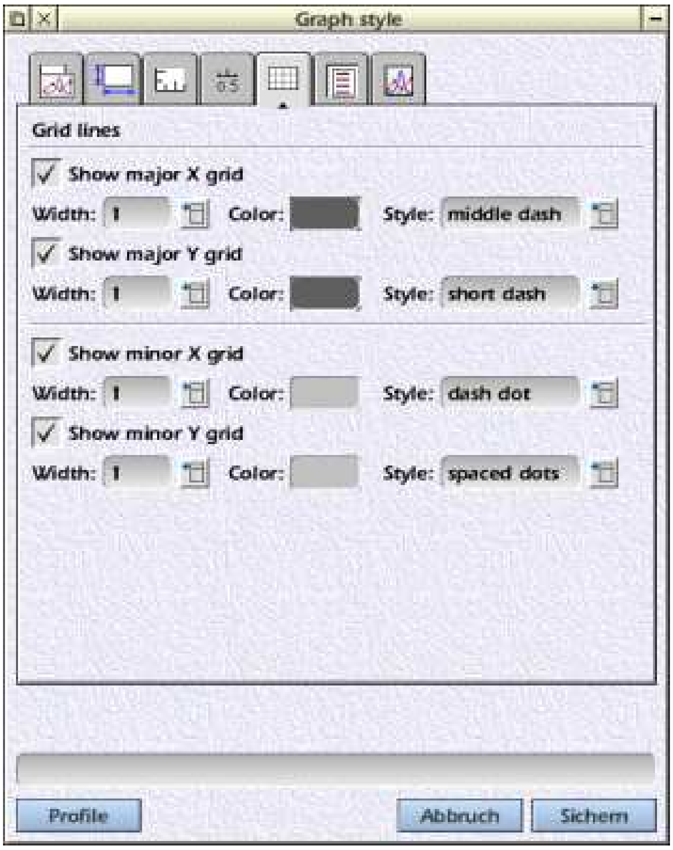


Alternate set to a value of 2

The alternate option is only available on the X and X2 axis. Note that the offset feature will also influence the vertical spacing between the labels. The maximum number you can set is 5.

4.3.6 Grid lines

luafox allows you to show gridlines of different thickness, color and style. The available styles are: solid, short dash, middle dash, long dash and dash dot as known from draw. Additionally there are dots and spaced dots available. These dash patterns are still fully compatible with the draw format and should display fine in every application.



Grid lines

☑ Show major X grid

Width: 1 Color: Style: middle dash

☑ Show major Y grid

Width: 1 Color: Style: short dash

☑ Show minor X grid

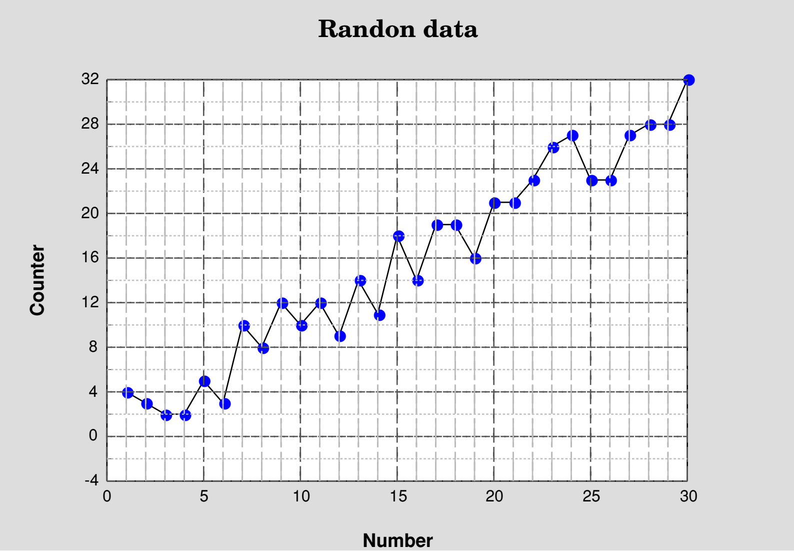
Width: 1 Color: Style: dash dot

☑ Show minor Y grid

Width: 1 Color: Style: spaced dots

Display grid lines in X and Y direction

The grid lines are shown at the positions of the major and minor ticks even if they are not shown. This also influences how many minor grid lines are shown.

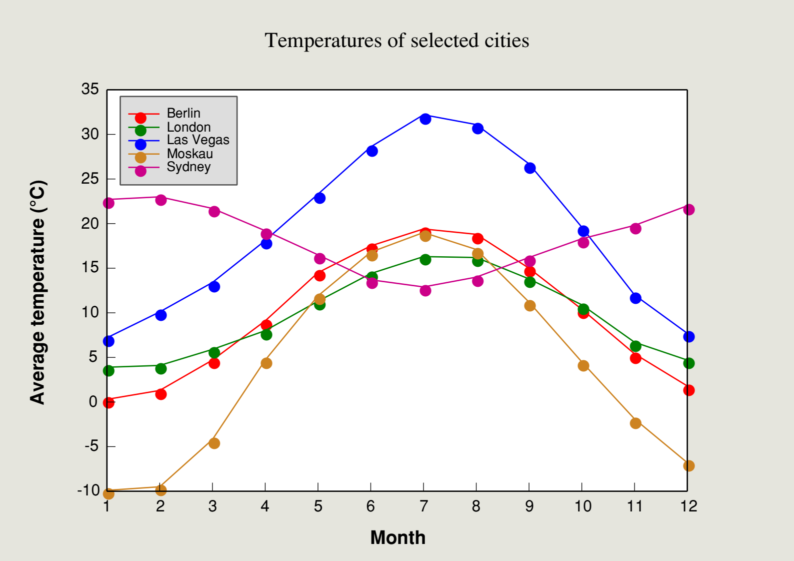


Graph with grid lines

4.3.7 Caption

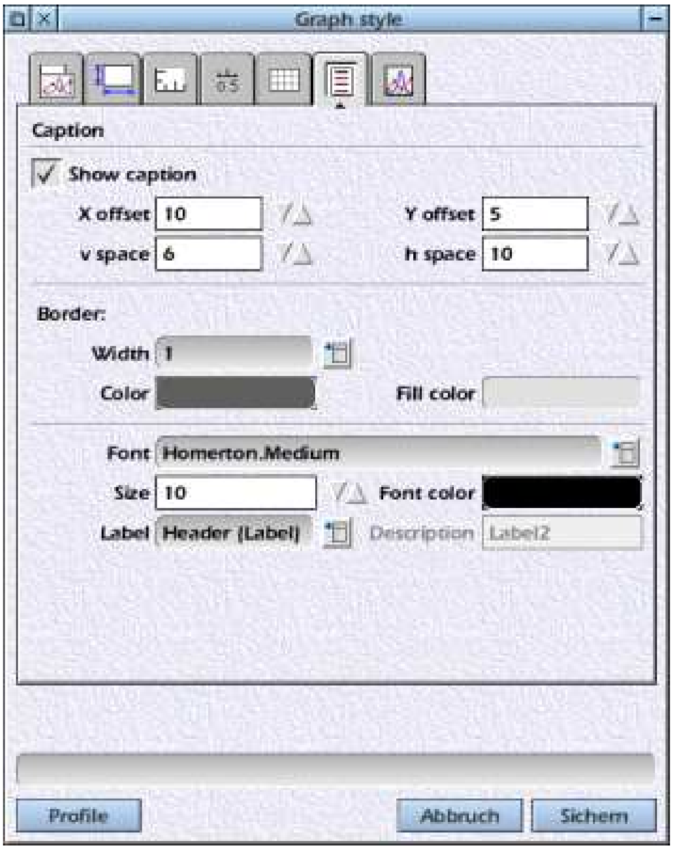
A caption will show all lines plotted together with information about the curve being shown. You can specify an X and Y offset from the top left corner of the graph. The v space and h space values influence the distance between elements and between the border of the caption. You can set a border and fill color as well as the line width of the border.

You can define a font, font size and color for the descriptions in the caption. The content of the caption can also be chosen. This can either be just the column number or full info which shows the table and column number. It is recommended that you use the Label field of the header and display this information in the caption. Alternatively you can also show another header line by choosing "Header (Other)" and entering the name of the header line into the writeable field.



Caption shown in the top left corner of the graph

The caption will show the curve symbol and line style next to the description, to make identifying the curves easy. For the symbol the color of the first (leftmost) symbol in the graph is taken because the symbol color may vary.



Caption

☑ Show caption

X offset 10 Y offset 5

v space 6 h space 10

Border:

Width 1

Color Fill color

Font Homerton.Medium

Size 10 Font color

Label Header (Label) Description Label2

Configure the appearance of the caption

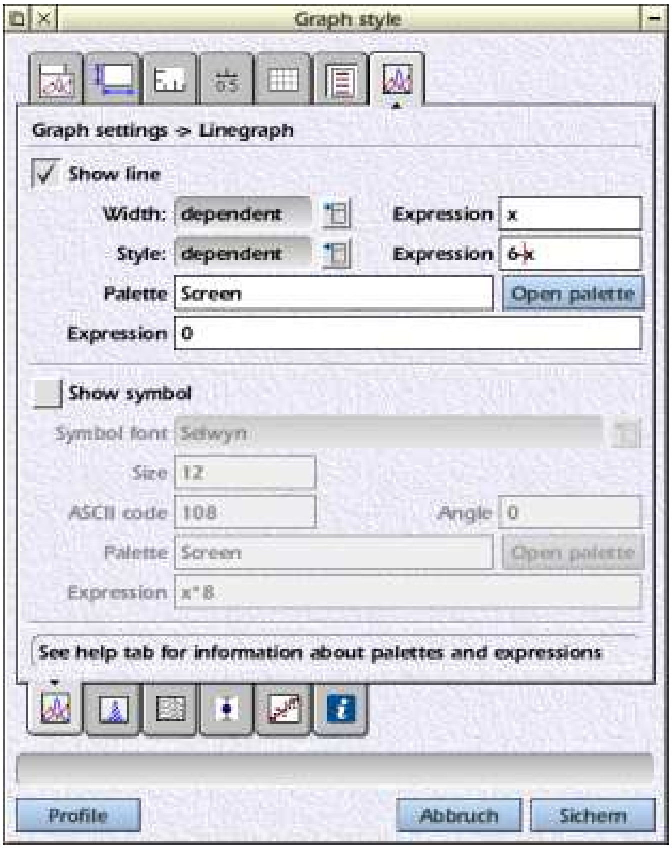
The temperature data shown in this example and in the following sections can be found inside the data directory supplied together with luafox. It shows the average temperature for every month of the year in Berlin, London, Las Vegas, Moscow and Sydney.

4.4 Line graph

The line graph tab has a number of sub tabs that will influence the style of the line graph, You can define here the line and symbol style, configure a fill color and an offset to arrange curves next to each other or on top of each other. You can also set error bars and define a style for fits.

4.4.1 Line and symbol style

In the first sub tab you can define the line and symbol style. Let's have a look at the line style first. From the menu you can choose a line width and a dash pattern. You can choose a fixed value from the menu or take the last menu entry called "dependent". This enables the writeable field to the right of the menu and you can enter an expression.



Graph settings -> Linegraph

☑ Show line

Width: dependent — Expression x

Style: dependent — Expression 6-x

Palette Screen — Open palette

Expression 0

□ Show symbol

Symbol font Selwyn

Size 12

ASCII code 108 — Angle 0

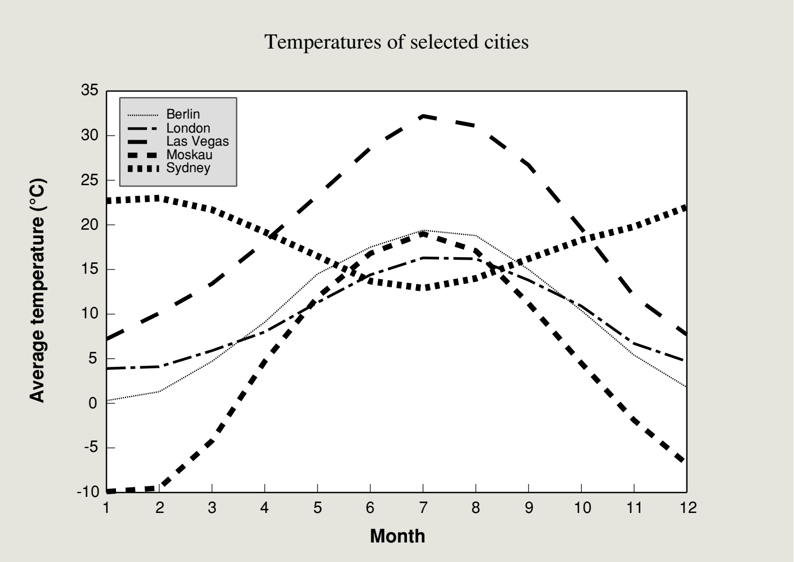
Palette Screen — Open palette

Expression x*8

See help tab for information about palettes and expressions

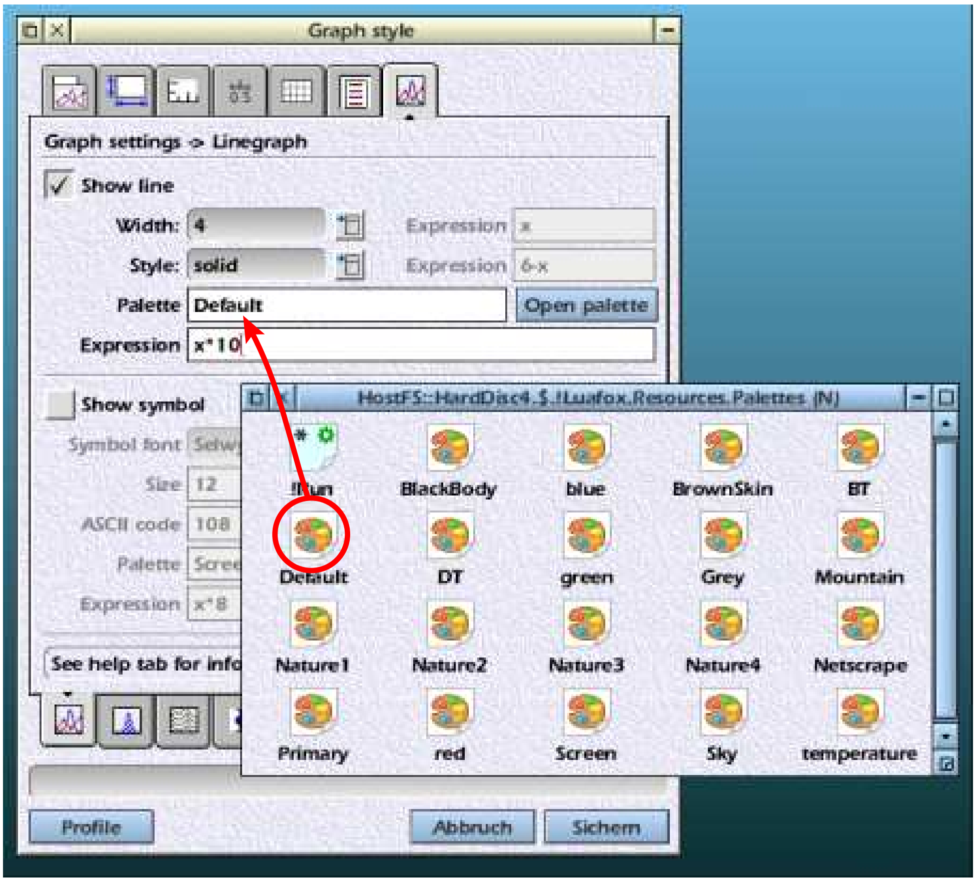
Setting the line width and a dash pattern

Each curve belongs to a column in a table and hence you refer to the curves by the variable x. For the first curve x will be 1, for the second 2 and so on. So you can use an expression containing x to control the line style. Of course you can also control the line color. The line color is defined by a RISC OS palette file. You can choose the palette to be used for the line color. A palette file contains 256 colors and in the expression field you can define which palette color is used as line color.



Use an expression to set the line width and style

To view the available palettes click the open palette button and a filer window opens that shows all available palette files. You can add more to this directory if you want. Just drag a palette file to the writeable field left of the button or enter the name of the file there.


Graph settings -> Linegraph

☑ Show line

Width: 4 — Expression x

Style: solid — Expression 6-x

Palette Default — Open palette

Expression x*10

□ Show symbol

Symbol font Selw

Size 12

ASCII code 108

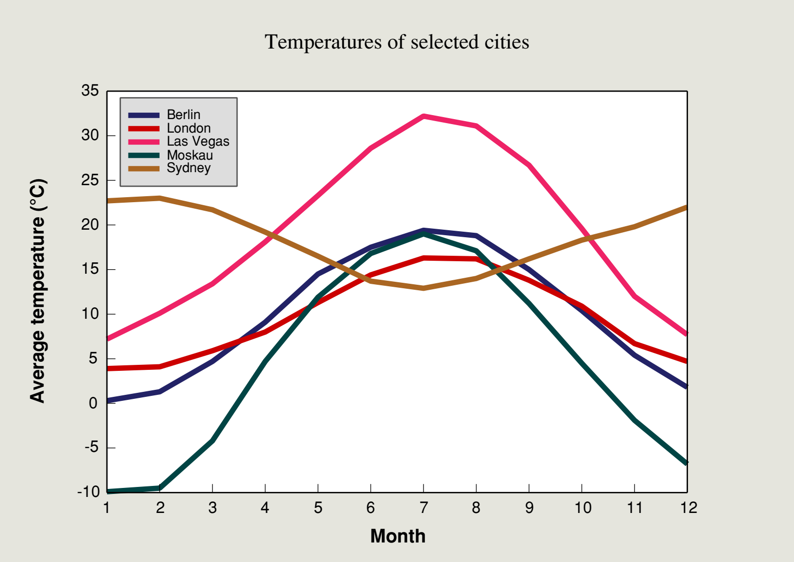
Palette Scree

Expression x*8

See help tab for info

Select a palette by drag & drop

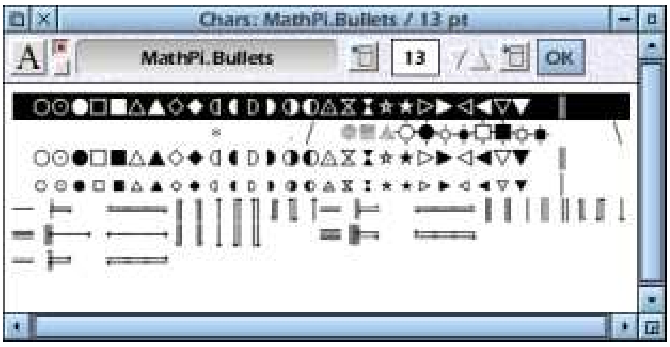
You can enter an expression in the field below. The settings as shown above will produce a graph like this:



Setting line colors by using palette files

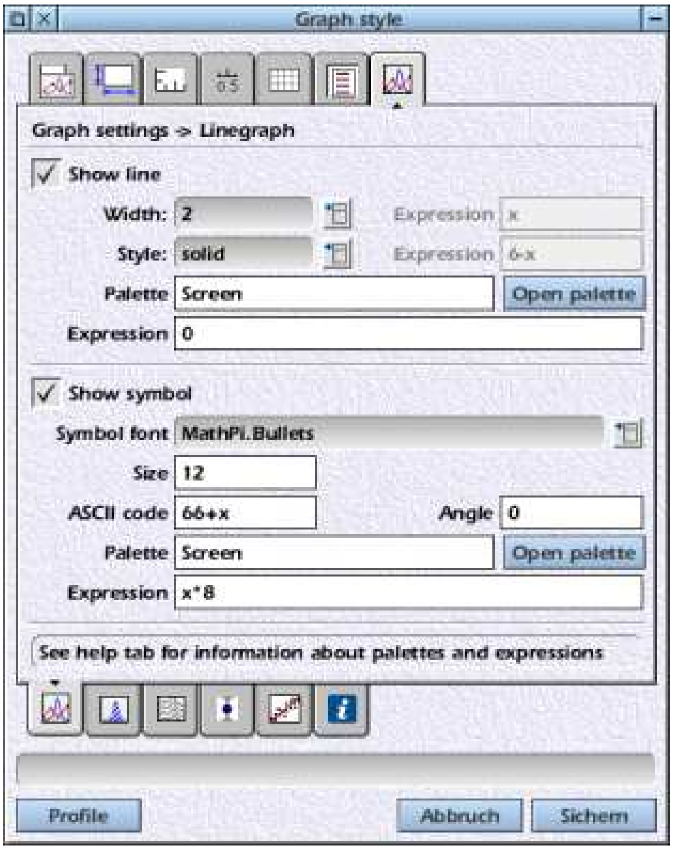
In this version of luafox it is not possible to set the color of lines individually. If you want to do that either use !Draw or another vector package and import the draw file into it to change the coloring or add text to the graph. Another possible way is to use the expression field and the list command. Create a new table e.g. with the name "Color" which contains just one column and insert the number of the palette color you would like to use in every row. Now use the expression `list("Color",x)` and the values are read from this table.

Let's have a look at the symbols representing data points. The symbols are defined by a font which can be chosen freely from all installed fonts. In most cases a symbolic font will be the best choice. luafox contains a special font for displaying data points which is called MathPI.Bullets:



Chars application showing the MathPi.Bullets font

You choose the symbol by entering the ASCII code for the character. In the case of the MathPI.Bullets font it may be a good idea to start with 65, an open circle. You can also choose a size and an angle under which the symbol is shown. The symbol color is defined like the line color described above. All fields allow you to use an expression to display the graph.



Graph settings > Linegraph

☑ Show line

Width: 2 Expression x

Style: solid Expression 6-x

Palette Screen

Expression 0

☑ Show symbol

Symbol font MathPi.Bullets

Size 12

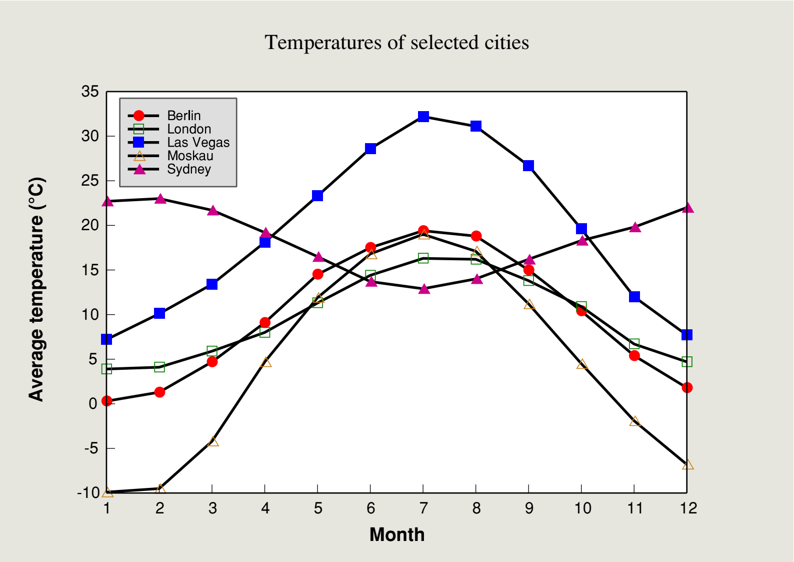
ASCII code 66+x Angle 0

Palette Screen

Expression x*8

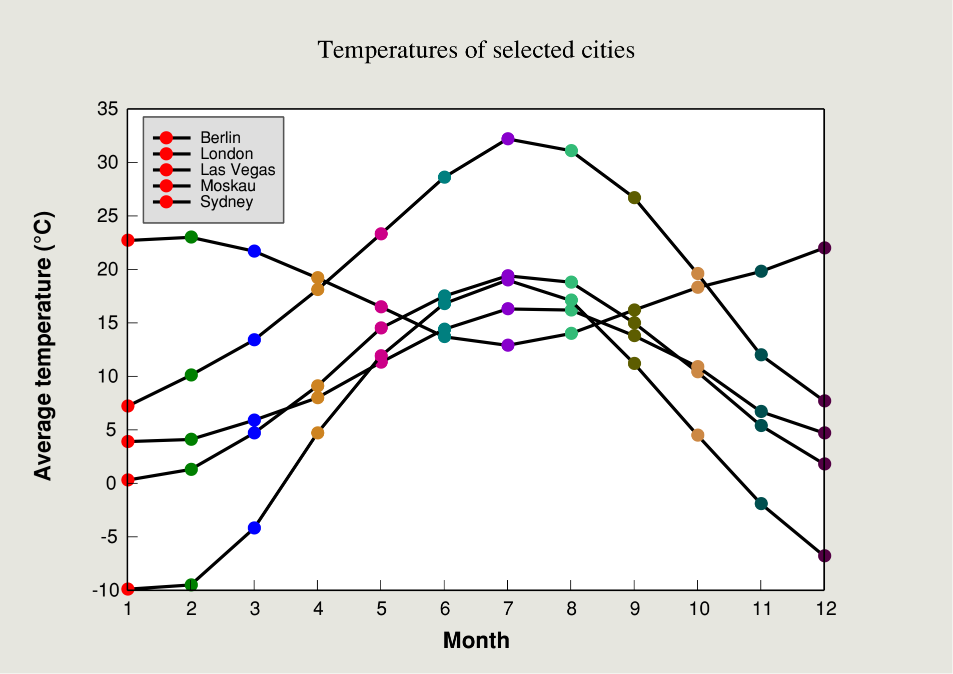
See help tab for information about palettes and expressions

Setting the symbol and its style

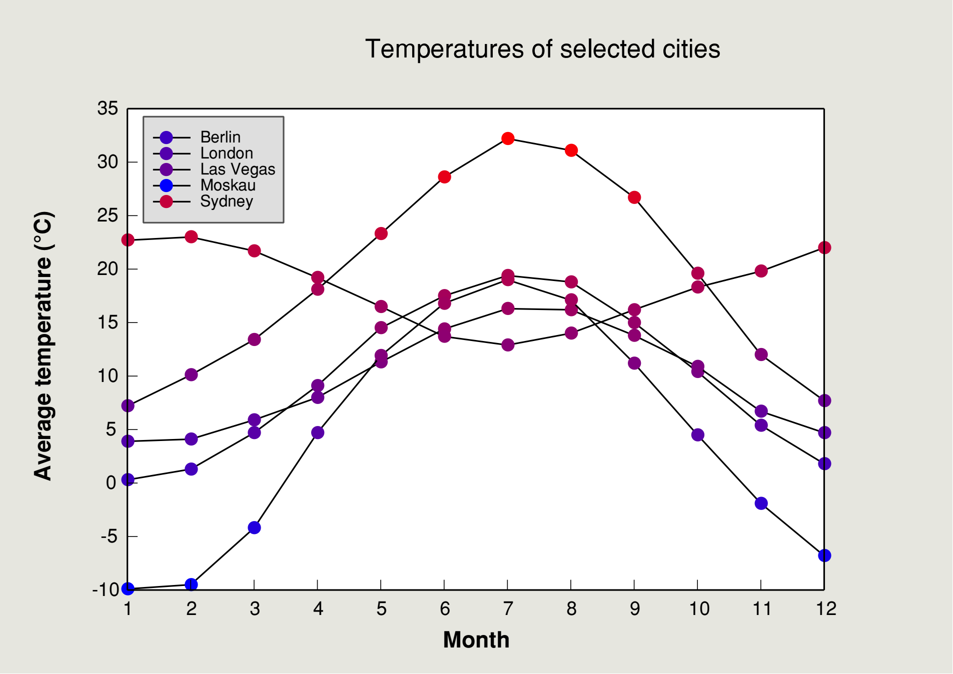


Graph using the settings as above

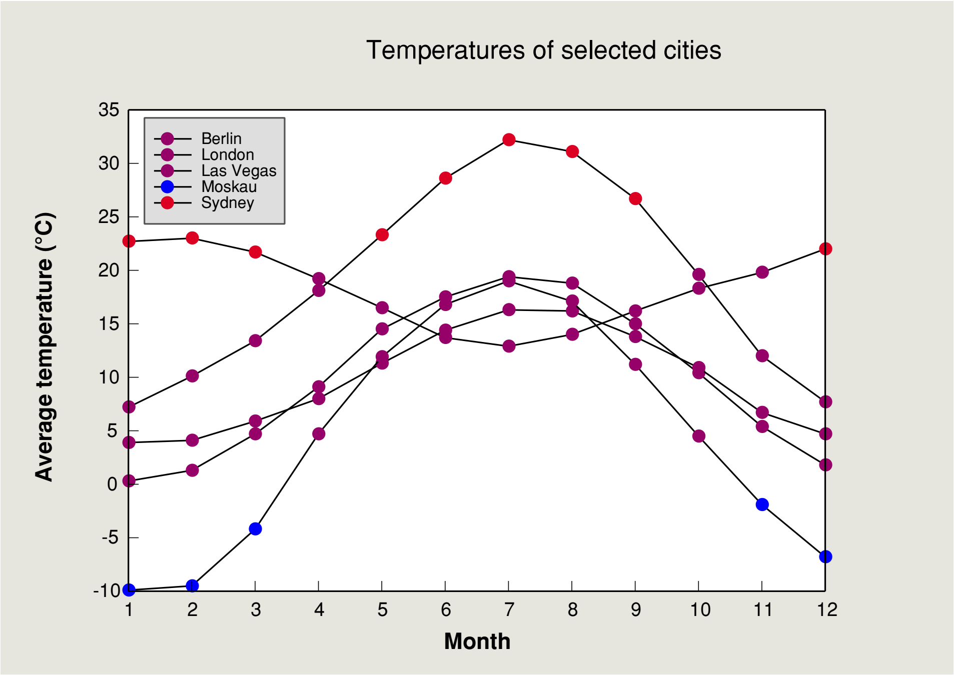
The use of expressions makes the symbol style very powerful. In the following examples a number of different expressions are used. The expressions are based on the lua language and some examples are given in the next chapter. In the graph shown above an expression `x*8` has been used for the symbol color. This ensures that every curve is colored differently. Here x is multiplied by 8 to increase the difference between colors because neighboring colors may be too similar, depending on the palette used.



Here the expression `y*8` is used where y represents the data rows of the data.



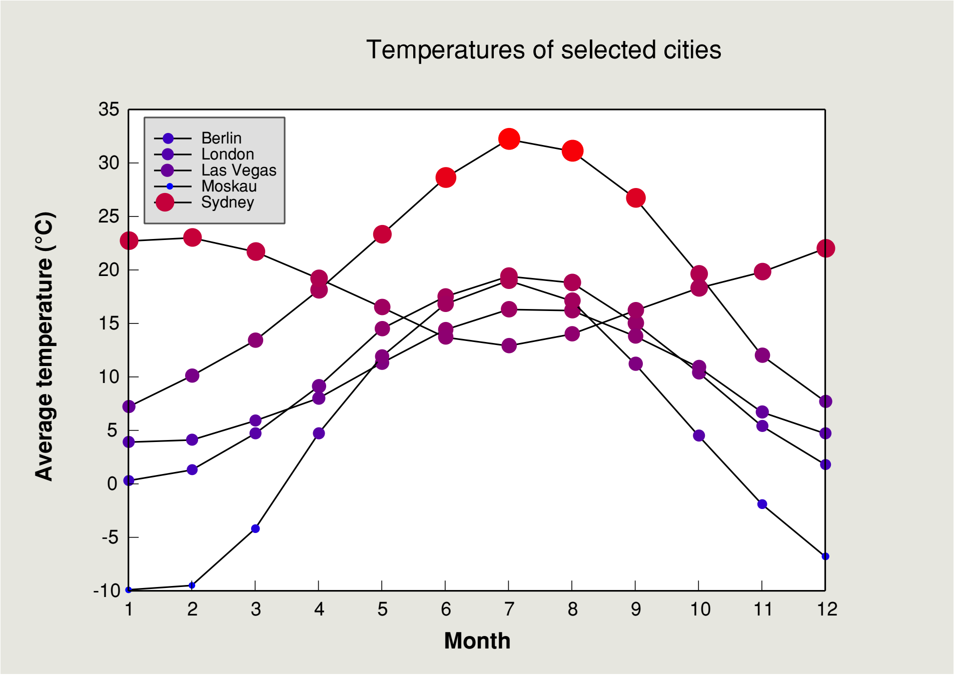
Another variable you can use is v which represents the data value. The above graph uses the expression `v*6+60` and the palette "temperature" which fades from blue to red to represent temperature values.



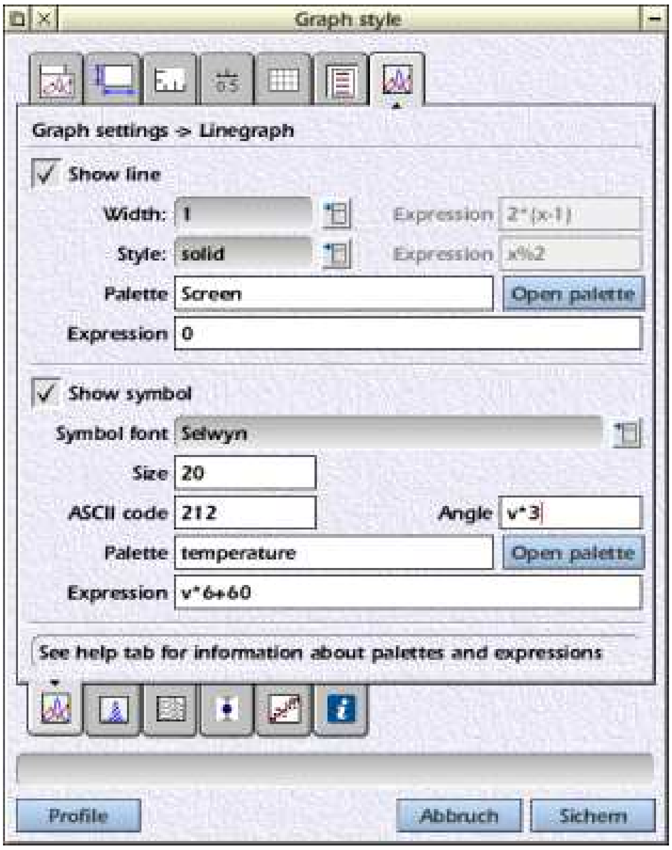
Here there are only three colors used: Below 0°C, below and above 20°C. This is defined by the following expression:

`v < 0.0 and 0 or v < 20.0 and 150 or 220.`

Please note that you need to use floating point numbers when doing comparisons. Using "20" instead of "20.0" does not work (see chapter about lua expressions).



In this example the symbol size is scaled with the value so that data symbols for high values are larger than those of small values. This is done by using the expression `10+ v/3` in the size field.



Graph style

Graph settings -> Linegraph

☑ Show line

Width: 1 — Expression 2*(x-1)

Style: solid — Expression x%2

Palette Screen — Open palette

Expression 0

☑ Show symbol

Symbol font Selwyn

Size 20

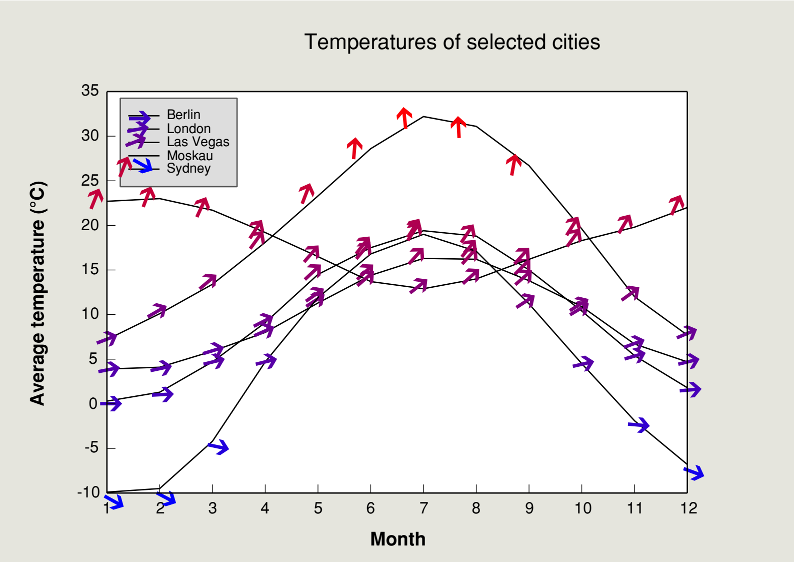
ASCII code 212 — Angle v*3

Palette temperature — Open palette

Expression v*6+60

See help tab for information about palettes and expressions

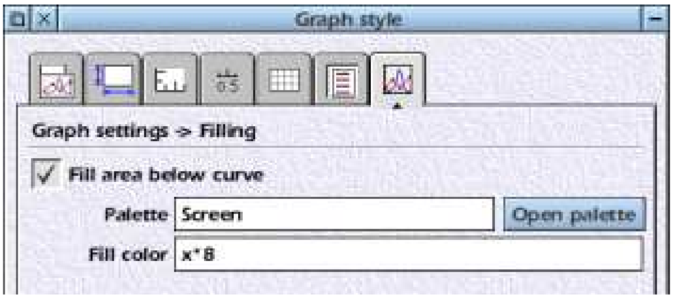
Configuration for displaying arrows indicating the temperature



It is also possible to rotate the symbols to a given angle. This can be used to "create" new symbols by rotating an existing one or to represent values like in this case where the orientation of the arrows indicates the temperature.

4.4.2 Filling

The second sub tab allows you to fill the area below the curve. Again you can choose a palette for the fill color and use an expression. The fill color is independent of the line color.



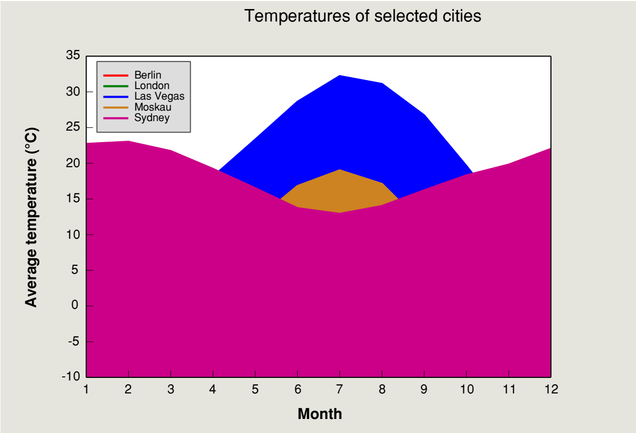
Graph settings > Filling

☑ Fill area below curve

Palette: Screen

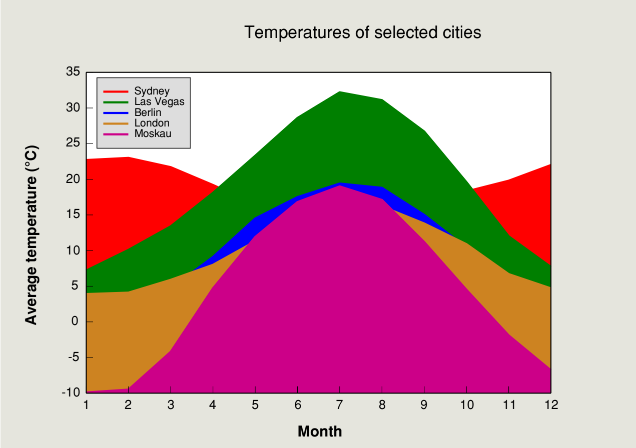
Fill color: x*8

Configuring the fill color



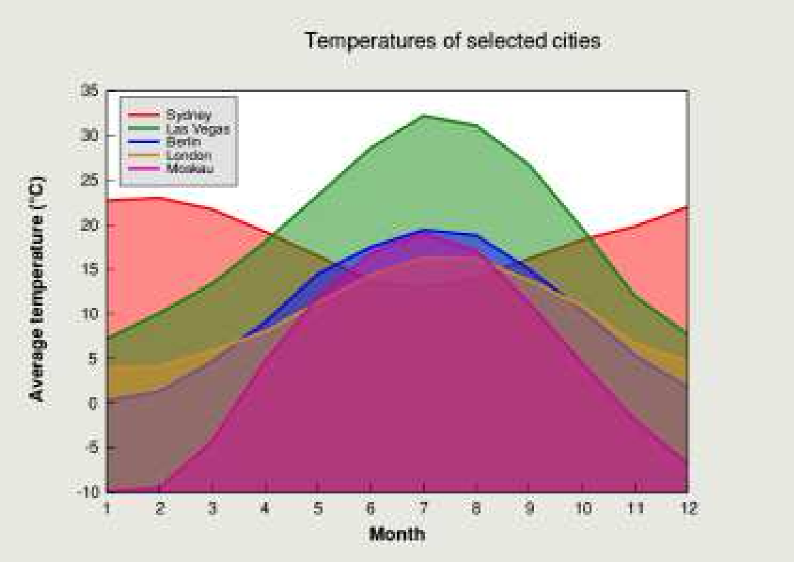
Depending on the order of the data columns used to plot the graph the result may not look as intended.

The graph above does not look good and some curves are not shown at all. You can rearrange the data columns in the table and click on the refresh button on the toolbar of the graph window to get a better result:



Rearrange the data columns in the table to show all curves

If you own a vector graphics program that supports transparency, like e.g. ArtWorks, you can further enhance the graph:

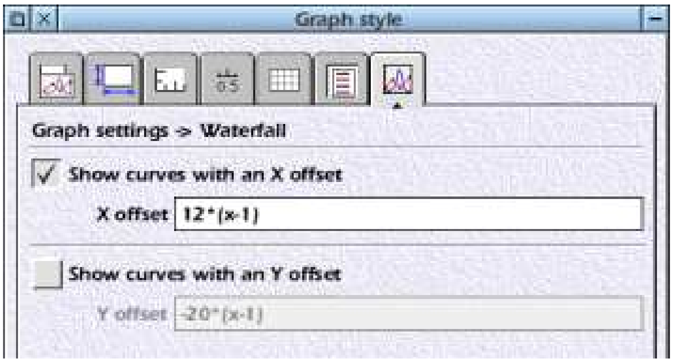


The same graph with transparency applied in an external application

Another possibility is to present the graphs on top of each other or next to each other using the next sub tab: Waterfalls

4.5 Waterfall

You can apply an offset to the graphs by using the third sub tab. You have the option to add an X or Y offset and give an expression to calculate the offset.



Graph settings -> Waterfall

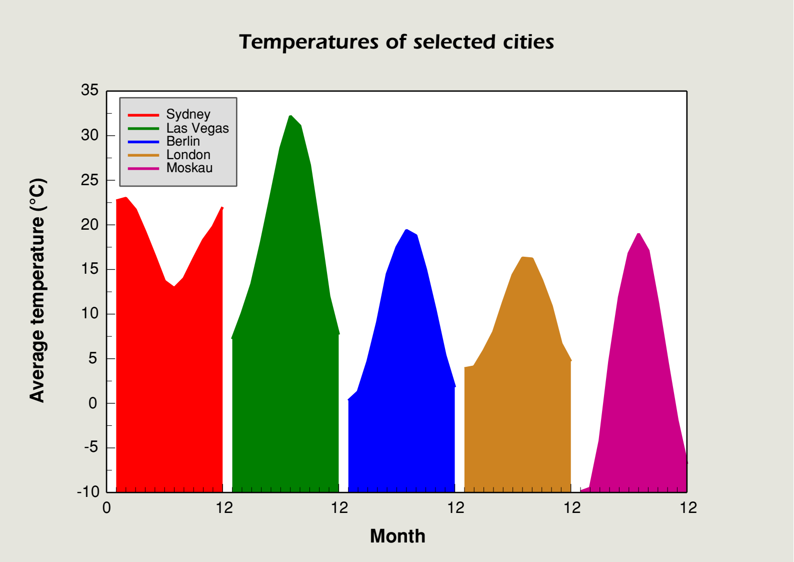
☑ Show curves with an X offset

X offset 12*(x-1)

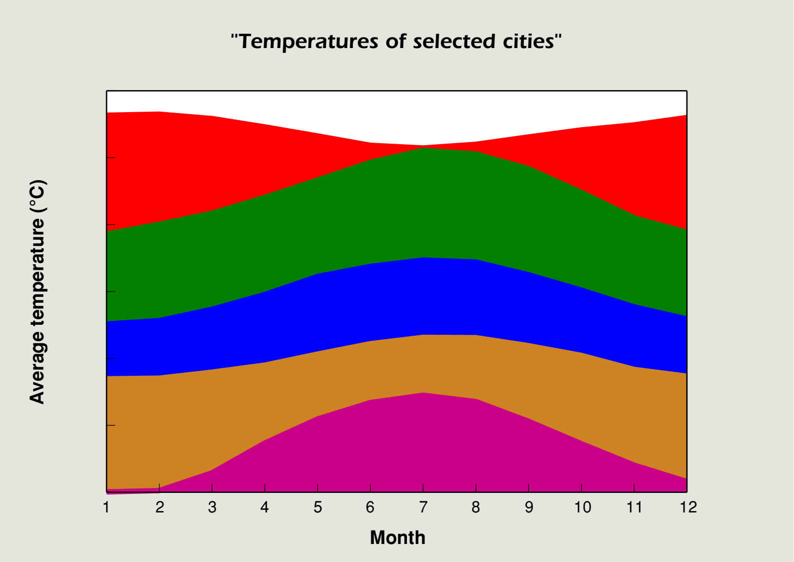
□ Show curves with an Y offset

Y offset -20*(x-1)

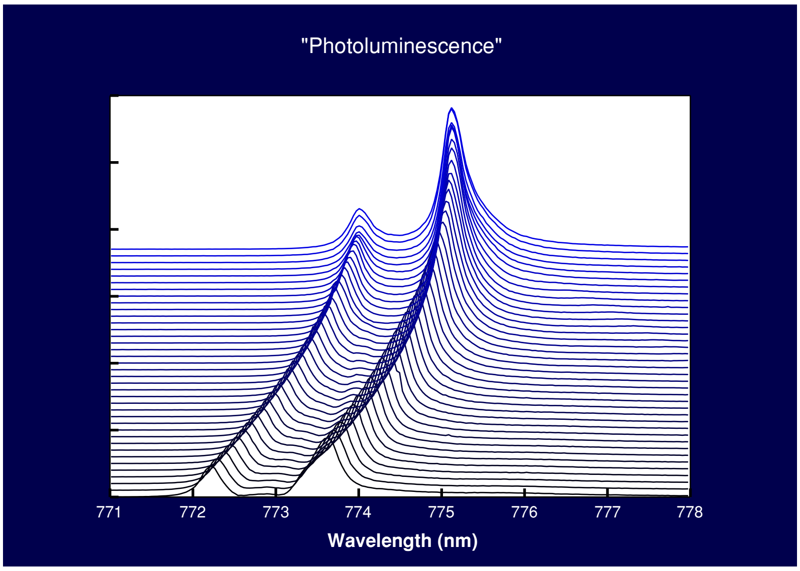
Applying an horizontal X offset



Showing the temperature curves next to each other. The tick labels need to be adjusted to show the correct values on the X axis.



Applying a Y offset with the expression `-20*(x-1)`.

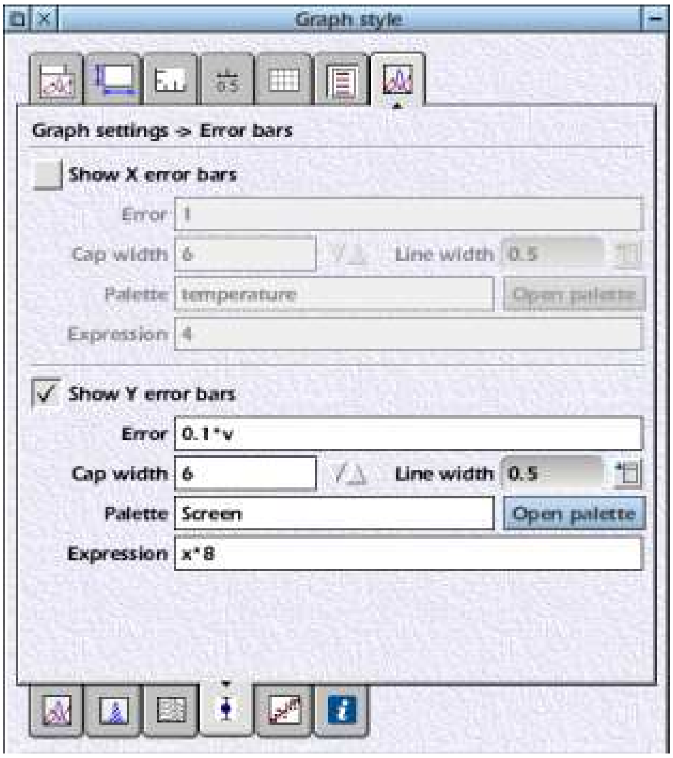


This graph has also been created by using a waterfall with Y offset.

4.6 Error bars

luafox can display X and Y error bars. Again the style of the error bars can be defined according to your needs. The line width and the width of the cap can be defined as well as the color of the bars. The value can be set in an expression field.

You can set a fixed value for the error or one relative to the value like shown above. As in all other expression fields you can also access all table values. X error bars can be defined in exactly the same way.



Graph settings -> Error bars

□ Show X error bars

Error 1

Cap width 6 Line width 0.5

Palette temperature

Expression 4

☑ Show Y error bars

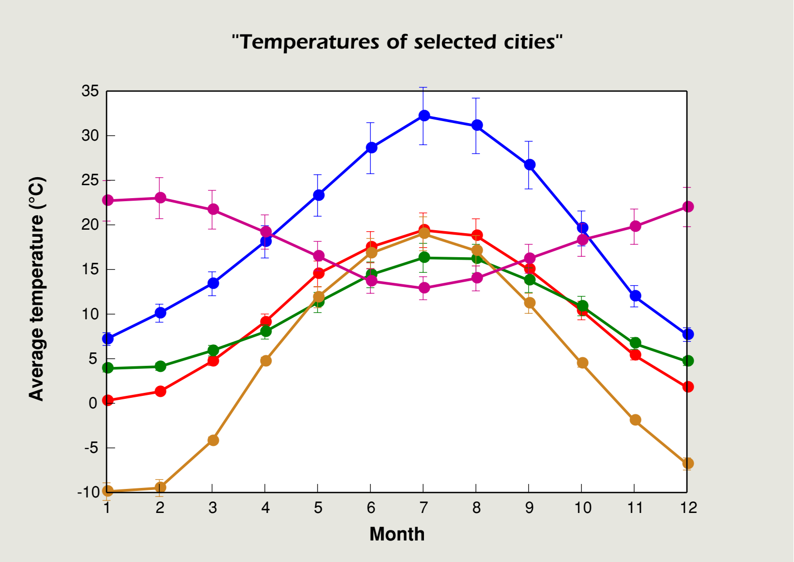
Error 0.1*v

Cap width 6 Line width 0.5

Palette Screen

Expression x*8

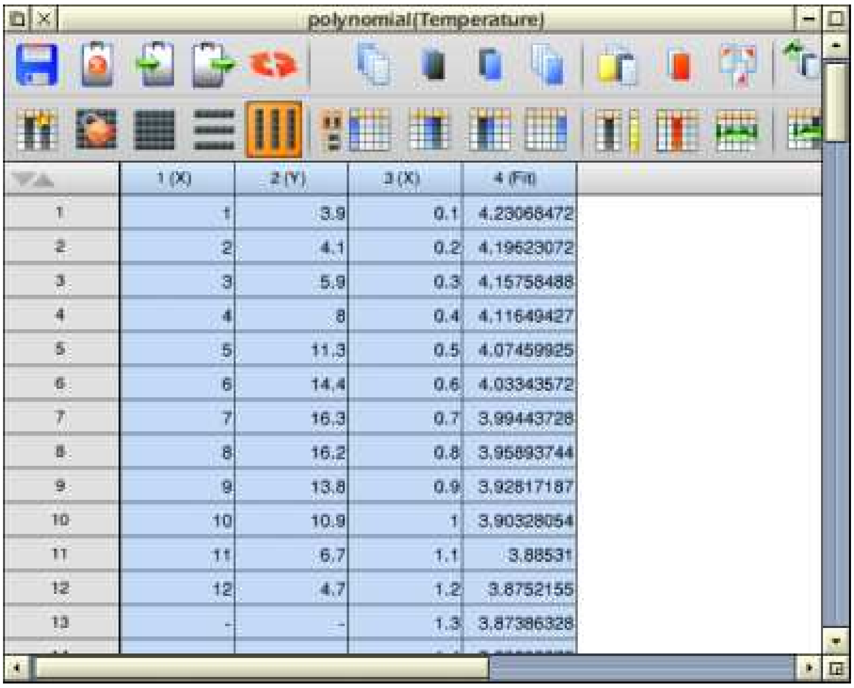
Configuration for the error bars



Graph with Y error bars. The error is 10% of the value here.

4.7 Fitted data

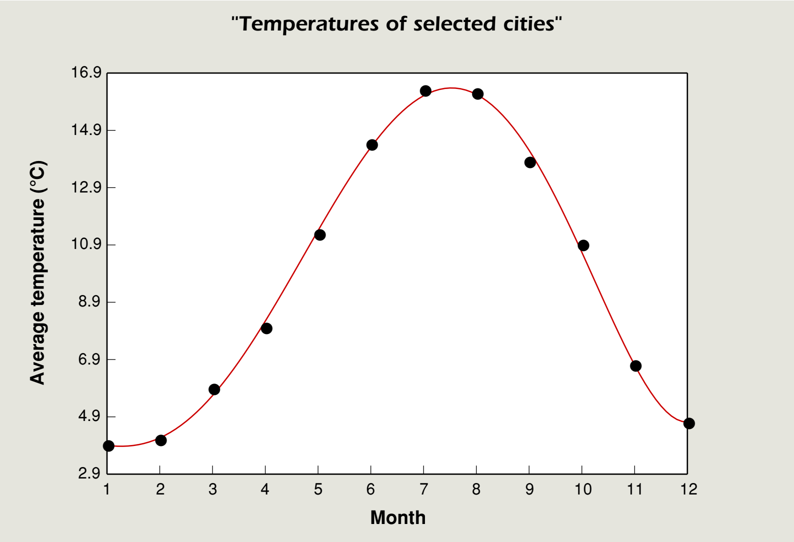
If you fit data with luafox the data type is set to "Fit". In principle columns set to fit are treated in the same way as Y data, but a different style is used to display the fitted data.



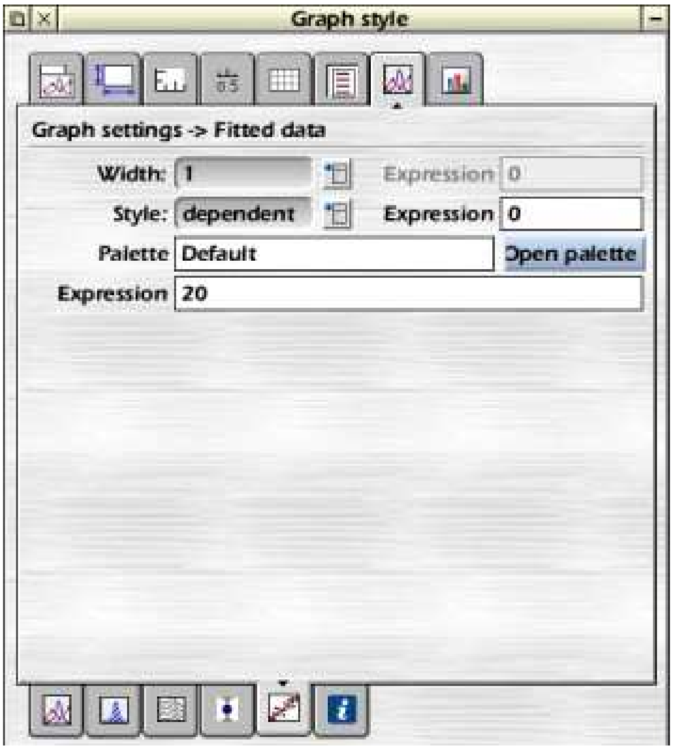
	1 (X)	2 (Y)	3 (X)	4 (Fit)
1	1	3.9	0.1	4.23068472
2	2	4.1	0.2	4.19623072
3	3	5.9	0.3	4.15758488
4	4	8	0.4	4.11649427
5	5	11.3	0.5	4.07459925
6	6	14.4	0.6	4.03343572
7	7	16.3	0.7	3.99443728
8	8	16.2	0.8	3.95893744
9	9	13.8	0.9	3.92817187
10	10	10.9	1	3.90328054
11	11	6.7	1.1	3.88531
12	12	4.7	1.2	3.8752155
13	-	-	1.3	3.87386328

Data points and a polynomial fit of them

In the default settings Y columns are shown by symbols only and a fit to this data is shown by a red line. This is the default setting because in most cases experimental data points should not be connected by lines because this suggest that unmeasured points between two data points would be on this line which in general is not the case. The configuration allows you to define the line width, style and color of the fitted line.



Experimental data is often shown as individual data points together with a fit represented by a continues line.



Graph settings -> Fitted data

Width: 1

Expression 0

Style: dependent

Expression 0

Palette Default

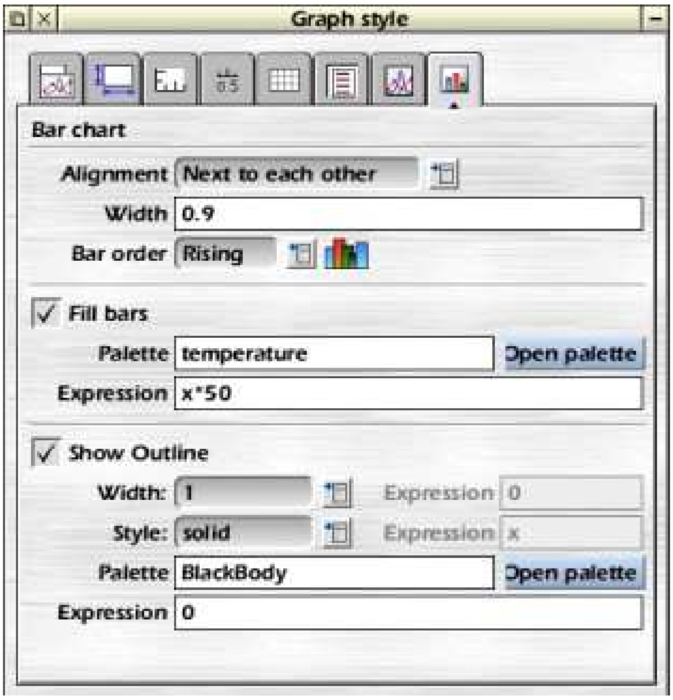
Expression 20

Define the style for the fitting line

4.8 Bar graph

(introduced in luafox 1.2)

A new main graphical tab has been added to the graph style configuration allowing you to change the appearance of bar graphs:



Bar chart

Alignment: Next to each other

Width: 0.9

Bar order: Rising

☑ Fill bars

Palette: temperature

Expression: x*50

☑ Show Outline

Width: 1 — Expression: 0

Style: solid — Expression: x

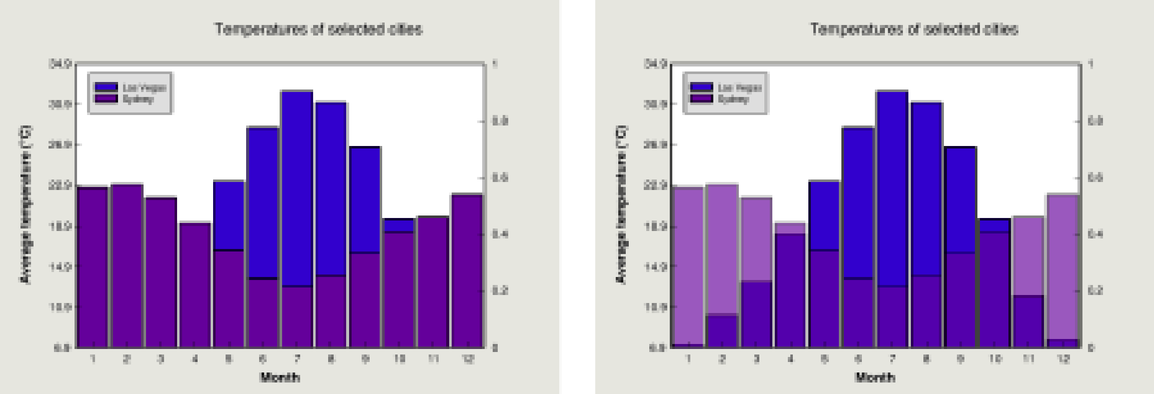
Palette: BlackBody

Expression: 0

Settings for the bar graph

4.8.1 Alignment

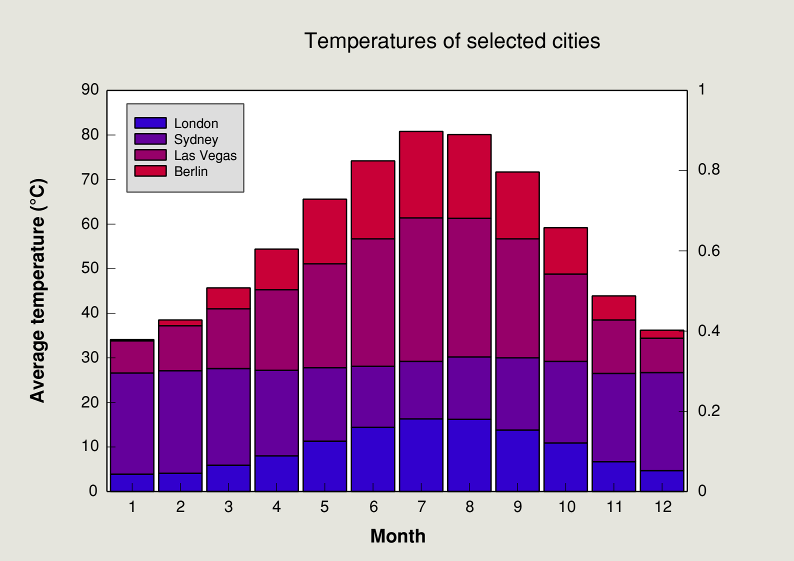
luafox supports four different ways of displaying graphs. "Bottom" means that all bars start from Value 0. This has the advantage the the top edge of a bar (or the bottom one in case of negative numbers) corresponds directly to the value on the Y-axis. However, if you have more than two data sets, then bars on the top may cover bars further in the background.



Using the "bottom" alignment may cover bars further in the background (left) unless the bars are made semi transparent in an external package like ArtWorks (right)

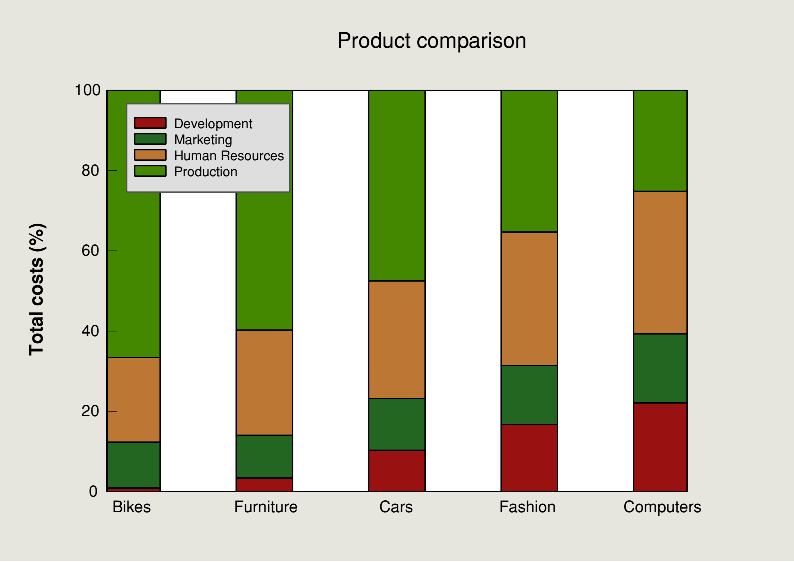
You can try to change the plot order to bring another data set to the foreground but it depends on the data values whether you will be able to show all information.

Another variant of the problem is to stack the bars on top of each other. Here the advantage is that all graphs are fully shown but reading the absolute values is very difficult. This type of graph is good to show relative differences between two or more values or if only the topmost value is important (e.g. if you have three bars for development, production and marketing costs which, put on top of each other, show the total costs). Please note that this graph type is not recommended for data sets which contain positive and negative values.



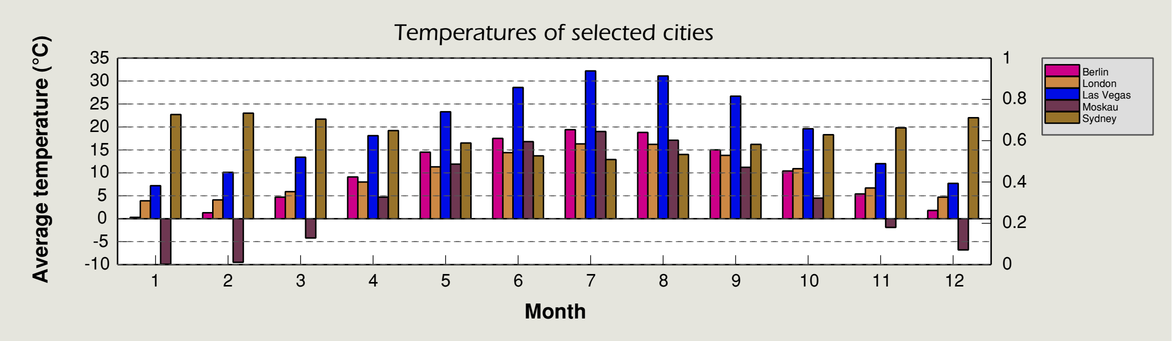
Bars stacked on each other

Another option is to show bars stacked realtively so that the total value will be 100 %:



Relatively stacked bars

The fourth option is to display the bars next to each other. This allows you to show all bars completely and to read the total value of each bar but the graph can get confusing if there are to many bars shown at once.



Bars plotted next to each other

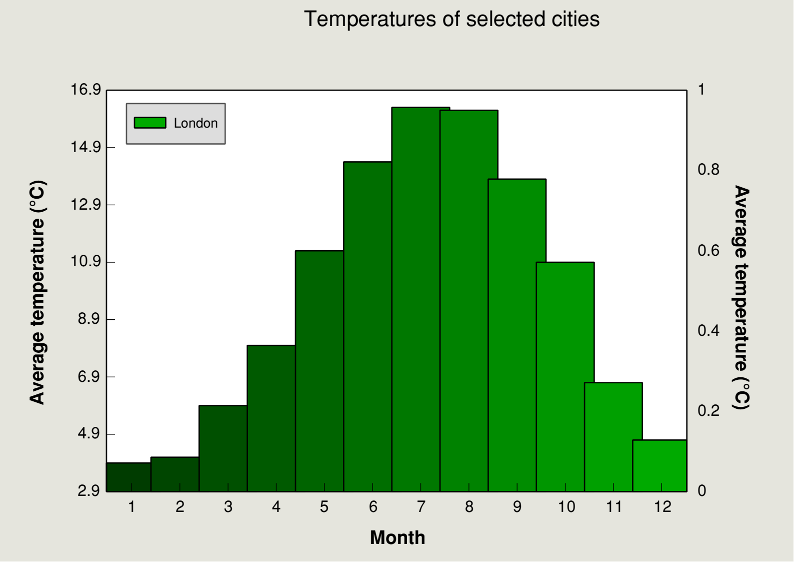
4.8.2 Width

The width of the bar is a relative number and the value 1 means that the width is equal to the distance between to major ticks. With a width of 1 two bars next to each other just touch each other, a value of 0.9 as shown in some of the above examples shows th bars with a small white space left between them.

For graphs with bars plotted next to each other the width is interpreted as space between each group of bars and not between each bar. In the graph above you see that there are 12 groups of 5 bars each. The width setting in this case was 0.7.

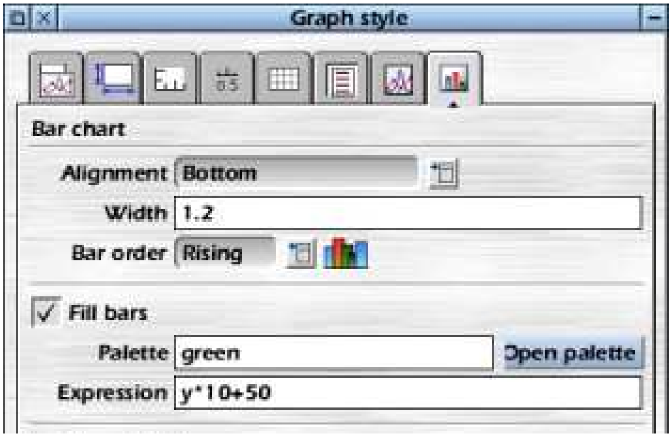
4.8.3 Bar order

If the width is set to values above 1 bars start to overlap and there is an additional style setting called the bar order which lets you define in what order the bars are plotted. What this means is shown in the following graph with rising bars:



"Rising" bars

At the right side you can see that the bar belonging to december is placed on top of november, that means in the foreground. Additionally the bars are sligtly different coloured to enhance the effect. This graph was plotted with the following settings:



Graph style

Bar chart

Alignment: Bottom

Width: 1.2

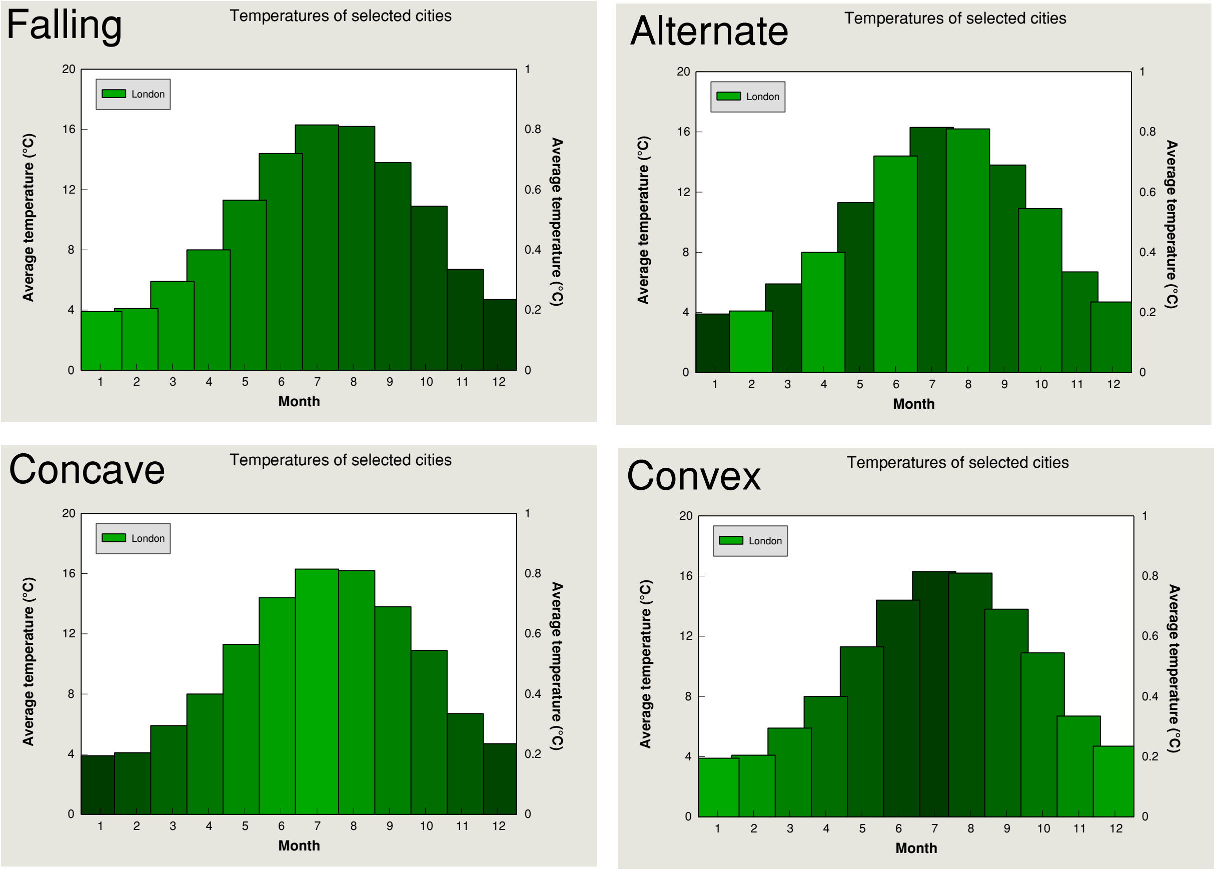
Bar order: Rising

☑ Fill bars

Palette: green

Expression: y*10+50

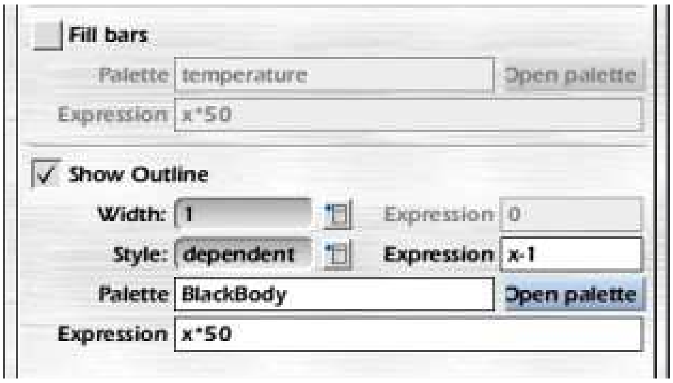
The fill style used here works in a similar way like the style definitions of the line graphs. A palette file defines the available 256 colors and the expression defines which of the 256 colors to take. Here y is the number of the bar plotted, so the first bar plotted has the value y = 1, the second bar y = 2 and so on. Because the palette file starts with with a very dark green (or black to be precise) and ends with a light green in the above graph the brightnes of the green bars increases from left to right. There are four different alternative orders left: "Falling" which draws the bars from right to left, "Concave" where the bar in the middle is in the foreground and "Convex" where it is in the background as well as "Alternate" where every second bar is in the foreground. The different orders are shown in the next graph:



Example of the other bar orders

4.8.4 Fill and outline style

As already mentioned in the previous paragraph the possibilities to fill the bars with a color and the way its outline looks can be defined very similar to the style settings of the line graph.



□ Fill bars

Palette: temperature

Expression: x*50

☑ Show Outline

Width: 1

Style: dependent

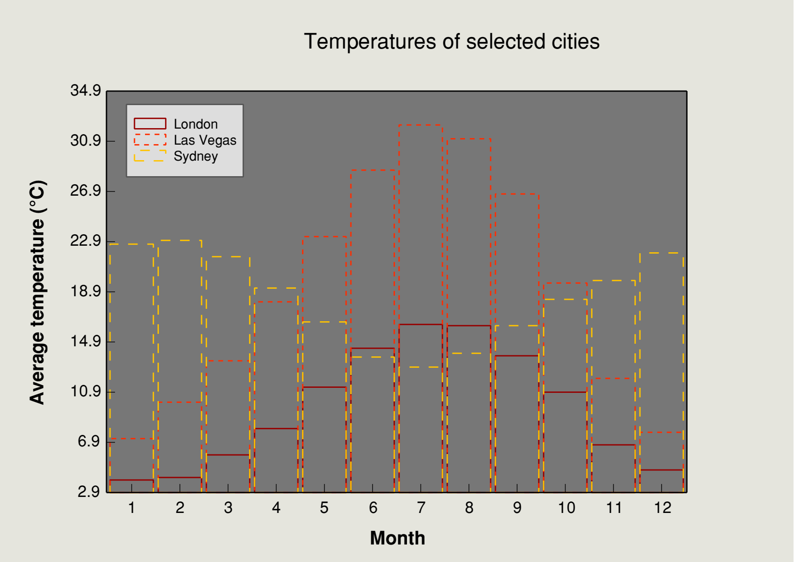
Expression: 0

Expression: x-1

Palette: BlackBody

Expression: x*50

With the setting above the bars are not filled and the dash style of the outline changes between the data sets (Style = dependent and Expression = x-1). Also the color information is taken from palette file "BlackBody" and then the expression x*50 is used as value for the outline color.



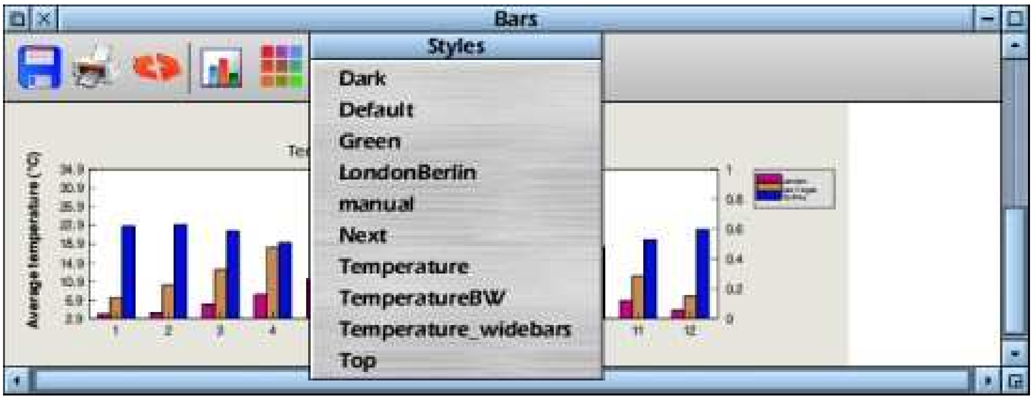
Bars with different outlines: Changes in dash pattern and color

4.9 Quick switching of graph styles

(introduced in luafox 1.2)

To configure the graph style ConiX is used which lets you save all current settings as profile which you can use in other graphs and which allows you to change between styles.

luafox 1.2 introduces a shortcut if you just want to change between predefined styles. Just click the Edit Style Button with the right mouse button and a menu pops up which shows the currently predefined styles. Selecting an entry will apply your choice to the graph.

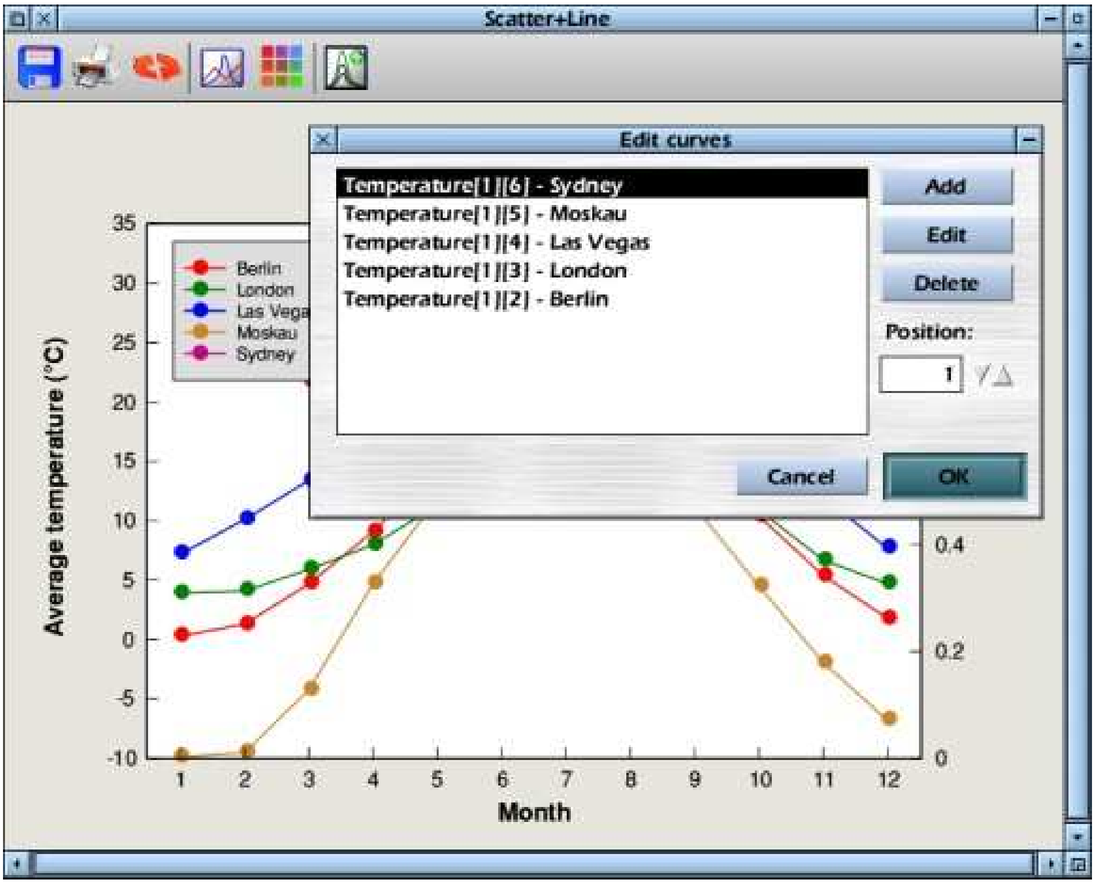


Click with Adjust on the Edit Style Button to open a menu with predefined styles to choose from.

4.10 Edit curves

(introduced in luafox 1.2)

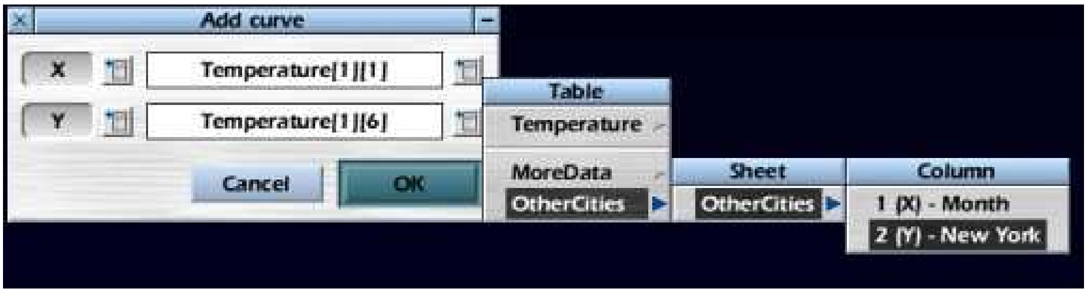
The Edit Curves Button opens a dialog listing all data sources shown in the graph and lets you add, delete and edit curves or bars shown in the graph.


Temperature[1][6] - Sydney
Temperature[1][5] - Moskau
Temperature[1][4] - Las Vegas
Temperature[1][3] - London
Temperature[1][2] - Berlin

Position: 1

Dialog box for adding, editing and deleting curves

On the left side all data sources shown in the graph are listed in the format Tablename[sheet][column] - Label. The label is only shown when it is defined. To add a new curve to the graph just click on the add button to open a new dialog box:

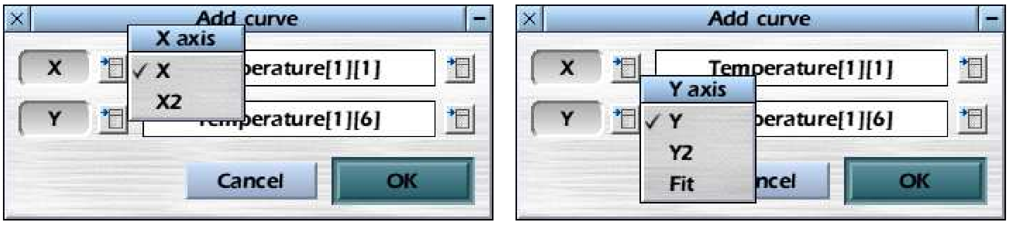


X Temperature[1][1]

Y Temperature[1][6]

Choose the data source using the menu structure

Press the menu button to browse through the available data stored in tables, sheets and columns. The menu is dynamically created and shows all tables stored in the Progam Manager.



Choose the x and y axis

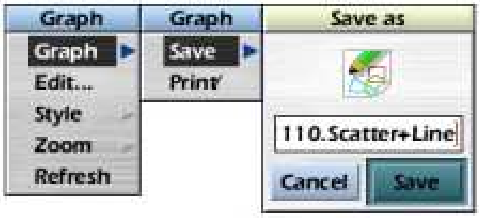
You can also choose the the x and y axis for the new curve. In the same way you can also edit an existing curve. Just select the curve to be changed in the list and click on the edit button.

To delete curves you can also just select them and press the delete button. The position of a curve can also be changed here. This will rearrange the list and therefore the plotting order in the graph. This can be usefull if in a bar graph bars where bars with higher values hide other, smaller bars. The result can directly be seen in the graph.

It is also possible to create a new graph from the Project Manager Menu, see the section about the Project Manager.

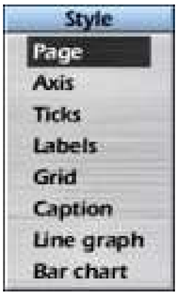
4.11 Graph menu

The menu of the graph window is very similar to the toolbox buttons. You can save the graph as draw file and print it.



Main graph menu

Click on the Edit... entry to open the dialog box which lets you add, edit and delete curves or bars to or from the graph. The style submenu allows you to open the main style configuration window already at the tab you want to edit:



Style sub menu

The Zoom submenu sets the current zoom level. Click refresh to recreate the graph. This is usefull if you changed data points in the table which are shown in the graph.

5 Lua expressions

As you might guess, luafox is written in the programming language lua, hence the name. It is planned that future versions of luafox will also allow the user to write their own scripts to perform tasks automatically. In the current version you only need to know a little bit about lua when dealing with writeable fields and user defined formulas. A complete description and user manual can be found online. There are good reasons to have a look at lua as a general programming language under RISC OS since it as easy to use as BBC Basic, but much more powerful. This section will describe a number of typical situations where you have to deal with the lua syntax.

5.1 Tables

The dominant data structure in lua and also in luafox is a table. Tables are created quite easily in lua:

```
Tablename = {23,642,54,7,0,66}
```

This command creates a table with the name "Tablename" containing the values in brackets. To access the values you use square brackets, e.g. `Tablename[3]` will have a value of 54 because this is the third table entry. Note that the first value of the table definition will be associated with the element number 1 and not 0 as you might expect. You can also set values by using an expression like `Tablename[22] = 12`. You do not need to set a dimension for the table beforehand; you can always insert elements anywhere in the table, e.g. in this example the elements 1-6 and 22 contain a value. If you try to access `Tablename[13]` for example the value will be nil; this is a special type in lua which is not zero and also not false. It just means that the value is undefined. You can also use this to delete table entries. If you enter `Tablename[22] = nil` the value will be set back to nil and the table only contains 6 elements again.

Unlike many other programming languages lua allows you not only to have numeric indices (also called keys) but also other kinds of objects. You can use a string, for example:

```
Tablename["info"] = "This is a string value"
```

So here the index or key is "info", a string, and the value is also a string in this case. It is not necessary that key and value have the same type:

```
Tablename["counter"] = 1
```

is perfectly valid. There is a shortcut to read or write this value. Instead of `Tablename["counter"]` you can simply use `Tablename.counter`. Both are identical and can be used at will. In lua it is even possible to use functions as keys or values which makes the table data type very powerfull.

A value of a table can also be another table. If you enter the expression:

```
Tablename[7] = {7,2,55,24,757,89}
```

Then the seventh element of the table Tablename will now contain another table. You can read this with an expression like `Tablename[7][3]` which has a value of 55. This structure is also used in luafox.

If you create a table in luafox it can have more than one sheet. Every sheet is stored in one element of the table you created. So if you create a new table called "Tablename" in luafox then `Tablename[1]` will contain the first sheet, `Tablename[2]` the second and so on. This "sheet" e.g. in `Tablename[1]` is another table with a number of elements. These elements contain the columns of a table. So `Tablename[1][1]` will be the first column of the first sheet, `Tablename[2][4]` will be the 4th column of the second sheet. Again every column consists of a number of data elements. These now contain the data values that are shown in a luafox table window. So `Tablename[1][1][1]` will have the value of the first element of the first column of the first sheet in table "Tablename". So in general you can access data values by an expression like:

```
Tablename[sheet][column][row]
```

Use an expression like this to access data values from other tables or as part of any expression.

5.2 Numbers

By default lua does not have different number types for integers, floats, doubles and so on. This is different from RiscLua. There, a numeric variable may only contain integer numbers. If you want to use floating point numbers you need to enter an expression like:

```
floatnumber = @"23.45"
```

Here "floatnumber" is just a name and you can replace it by any valid variable name, the important part is `@"23.45"` which defines a floating point value of that type. The type of this number is "userdata" and not "float" as you might expect. Lua allows you to define your own data types which have the type "userdata". If you have a variable containing a string like: `nstring = "23.45"` you can use `floatstring = @(nstring)`. To convert it back use an expression like

```
intnumber = #(floatnumber)
```

Again, "intnumber" is just a name, the important part is `#(variable)`.

All this is not usually important when using luafox because the transformation is done in the background. Unfortunately it is not always clear whether you want to use an integer or floating point variable. When comparing numbers, only integers or floats can be compared with each other:

Expression	Result
5 < 7	true
6 > 12	false
4.6 > 3.2	true
12.1 < 4.9	false
11.8 > 4	- (undefined)
11.8 > 4.0	true

There is a problem in the second last row because we try to compare a floating point number with an integer number. The easiest solution is to convert the integer number into a floating point number by adding a ".0", so to convert "4" into "4.0". This might not be as obvious when dealing with variables. If you enter an expression containing "v < 5" it may fail because the variable v is most probably a floating point value and 5 is not. You can try `v < 5.0` instead but this may fail if v is an integer. So the best way is to use `1.0*v < 5.0`, so to multiply an integer or float value (v) with a float value, because the result will be a float value in any case. An alternative is to use integers: `#(v) < 5` to convert the value v into an integer value, if it is a float value, otherwise this does not work. Use `#(1.0*v) < 5` to be sure it works in any case. Note that the #() operator always round down, so #(4.8) = 4!

5.3 AND, OR and NOT

The logic operators AND, OR and NOT can be very useful when dealing e.g. with graph styles or other expressions. When programming in lua an often used expression fordefining a variable is e.g.:

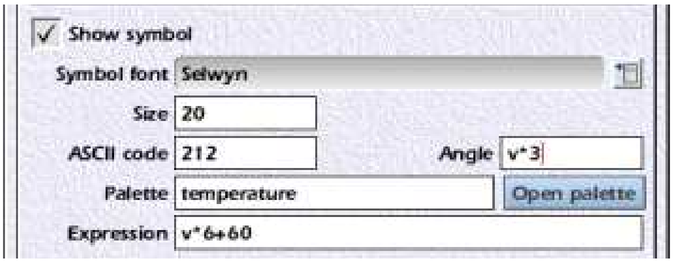
```
cellwidth = defaultwidth or 10
```

If defaultwidth is defined and does not have the value nil or the value false then cellwidth is set to defaultwidth. If defaultwidth is not defined then it will be set to 10.

When using "and" it can be even more powerfull:

```
cellwidth = type(defaultwidth) == "number" and defaultwidth or 10
```

The type command will return the type of a variable as a string, e.g. "string", "function", "number" or "table". The double equal sign is a comparison of two values which will return true if they are the same and false if not. So if defaultwidth is a number then `type(defaultwidth)` will return "number" and hence the expression `type(defaultwidth) == "number"` becomes true. If the first expression is true then the value after the "and" is taken, otherwise the value after the "or" is taken.



☑ Show symbol

Symbol font: Selwyn

Size: 20

ASCII code: 212

Angle: v*3

Palette: temperature

Expression: v*6+60

Use an expression to define the symbol color of a graph

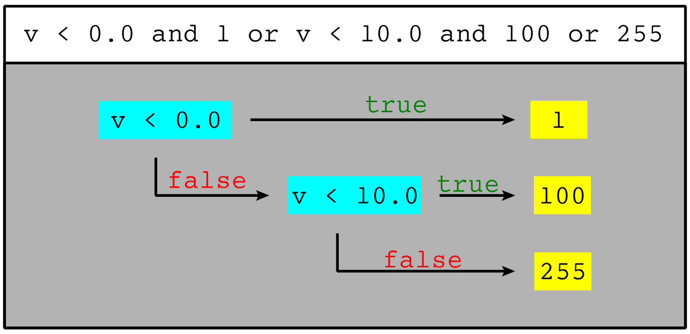
Let's take another example: When, editing the style of a graph, you would like to color the data points according to the value, you can enter an expression (see the Chapter about graphs). In the simplest case you would enter e.g. Expression = `v` where v is the value of the data point. If you plot some temperatures and you scale the coloring, as in the example above, you might end up with blue colors for low temperatures that fade into red colors for high temperatures. Now let's assume that you do not want a smooth color fade between blue and red but you would like to color all values below 0 blue, and all above red. You can do this with the following expression:

```
v < 0.0 and 1 or 255
```

if v is smaller than zero the expression will become 1 (this is the blue color in the temperature palette), otherwise it will be 255 (red color). You can also add more conditions:

```
v < 0.0 and 1 or v < 10.0 and 100 or 255
```

This will color everything below 0 blue (1), between 0 and 10 violet (100) and above red (255). This expression is also shown in the following diagram:



Interpretation of an expression

Note that if the first condition is true (v is below zero) the expression will become 1 and the rest of the expression is ignored.

So if you enter the following expression:

```
v < 10.0 and 100 or v < 1.0 and 1 or 255
```

There will be no blue data points. This is because all values smaller than 10 are also smaller then 0. So one the first condition is true the expression becomes 100 (violet). If it is false then also the second condition is false and the expression becomes 255 (red). So be carefull with the order of conditions.

You can also use brackets:

```
(v < 0.0 or v > 10.0) and 1 or 255
```

Now the expression will be 1 if the data point is below 0 or above 10, everything between will return a value of 255.

Remember that you need to use the double equal sign when comparing two values:

```
v == 0.0 and 1 or 255
```

This will make all data points red, except those exactly 0.

There is also an expression for "unequal":

```
v ~= 0.0 and 1 or 255
```

This will make all blue except values that are zero.

Also you can use the not expression to invert expression:

```
v < 5.0 and not (v < 0.0) and 0 or 255
```

This will color all data points red except those between 0 and 5.

6 Credits

I would like to thank a number of people who have helped me to develop luafox.

First I would like to thank the developers of the programming language lua and the people on the lua mailing list for their help with several questions. I am very grateful to Gavin Wraith, who ported lua to RISC OS and has helped me a lot. He also extended RiscLua based on my wishes. Thanks to Michael Lutz and David Manura for luamatrix.

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